

NATIONAL QUALIFICATION

13UY0165-6

**System Manager**

**Level 6**

REVISION NO: 00

VOCATIONAL QUALIFICATIONS AUTHORITY

Ankara, 2013

13UY0165-6 System Manager

Date of Publication: 12/06/2013 Rev. No: 00

PREFACE

This reference guide, namely System Manager (Level 6) National Qualification has been prepared in accordance with the provisions of the “Regulation on Vocational Qualifications, Testing and Certification” issued pursuant to the Vocational Qualifications Authority (VQA) Law no 5544.

The draft qualification has been drawn up by Turkish Information Technologies Association (TÜBİDER) appointed upon the cooperation protocol signed on 05.12.2011. After assessing opinions of the relevant organizations and institutions, the draft has been amended accordingly. The final draft has been evaluated by the VQA’s Information Technologies Sector Committee which has deemed it suitable. It has been approved by the Board of Directors of the VQA through its decision no 2013/45 of 12/06/2013 and decided to be placed within the National Qualification Framework (NQF).

We would like to extend our gratitude to all people, organizations and institutions that have expressed their opinions and contributed to the preparation, examination and verification processes of the qualification. We would like to offer it to the service of all likely beneficiaries.

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INTRODUCTION

The key criteria referred to in the national qualification preparation process, the relevant sector committees’ review and the VQA’s Board of Directors’ approval processes are set in the Regulation on Vocational Qualification, Testing and Certification.

National qualification is defined by:

1. Name and level of the qualification,
2. Aim of the qualification,
3. Occupational standard, occupational standard units or qualification units that provide the basis for the qualification,
4. Requirements for taking the qualifications test,
5. Learning outcomes and performance criteria per qualification unit,
6. Assessment and assessor's criteria to be implemented in the qualification process.
7. Validity period, renewal conditions, and holder surveillance conditions of the qualification certificate,
8. Sector Committee which confirms the qualification and institution which develops it.

National qualifications are built according to the relevant national occupational standards and/or to the relevant international occupational standards.

National Qualifications are set in cooperation with the bodies below:

* Formal and informal education and training institutions,
* Authorized certification bodies,
* Institutions having previously applied for authorization to the authority,
* Institutions having drawn up national occupational standard,
* Professional organizations

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13UY0165-6 SYSTEM MANAGER NATIONAL QUALIFICATION

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NATIONAL QUALIFICATION

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| 1 | NAME OF THE QUALIFICATION | System Manager |
| 2 | REFERENCE CODE | 13UY0165-6 |
| 3 | LEVEL | 6 |
| 4 | INTERNATIONAL CLASSIFICATION CODE | ISCO 08: 2522 |
| 5 | TYPE | - |
| 6 | CREDIT VALUE | - |
| 7 | A) DATE OF PUBLICATION | 12/06/2013 |
| B)REVISION NO | 00 |
| C) REVISION DATE | - |
| 8 | AIM | This qualification has been prepared in order to determine, assess and certify the knowledge, skills and qualifications required for a System Manager Level 6. |
| 9 | OCCUPATIONAL STANDARD(S) FORMING THE BASIS FOR THE QUALIFICATION |
| System Manager (Level 6) National Occupation Standard 13UMS0289-5 |
| 10 | REQUIREMENT(S) FOR TAKING THE QUALIFICATION TEST |
| - |
| 11 | STRUCTURE OF THE QUALIFICATION |
| 11-a) Mandatory Units |
| 13UY0165-6/A1 Occupational Health and Safety, Quality, Work Organization, Environmental Protection and Career Development13UY0165-6/A2 Fundamentals of Computer Hardware and Software13UY0165-6/A3 Fundamentals of Network Technologies13UY0165-6/A4 Fundamentals of Server Systems13UY0165-6/A5 Creating the Infrastructure of IT13UY0165-/A6 Configuration of the Network and Server Systems13UY0165-6/A7 Operation of the Systems and Applications13UY0165-6/A8 Maintenance and Troubleshooting in the Network and Server Systems |
| 11-b) Elective Units |
| - |
| 11-c) Alternatives for Grouping the Units and Additional Learning Outcomes |
| - |
| 12 | ASSESSMENT |
| In order to obtain the qualification certificate, a candidate must succeed at each of necessary qualification units at Group A. The performance assessment is performed according to the criteria mentioned in the assessment part of each item.The examinations can be made consecutively or independently. Examination questions should be prepared in a way that will assess all foreseen learning outcomes. A candidate must succeed at each of the required examinations for obtaining the Qualification Certificate within a period of one year. In case the period exceeds one year, the participant will have to retake the other exams at which he/she succeeded, as well.  |

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| 13 | VALIDITY OF CERTIFICATE |  |
| 14 | FREQUENCY OF SUPERVISION | At least one time during the validity of the certificate a vocational competency achievement report is required. Those who work independently is required to submit a statement of service. |
| 15 | ASSESSMENT METHODS TO BE FOLLOWED IN RENEWAL OF EXPIRED CERTIFICATES | For the renewal of expired certificate, a test, having the same scope with the initial certification and containing mostly questions related to state-of-the-art technological developments is applied. |
| 16 | QUALIFICATION DEVELOPMENT INSTITUTION(S) | TUBIDER IT Sector Association |
| 17 | SECTOR COMMITTEE TO VERIFY QUALIFICATION | VQA's Information Technologies Sector Committee |
| 18 | APPROVAL DATE AND NUMBER OF VQA's BOARD OF DIRECTORS | 12/06/2013 - 2013/45 |

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NATIONAL QUALIFICATION

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Date of Publication: 12/06/2013 Rev. No: 00

13UY0165-6/A1 OHS, Quality, Environmental Protection,

Work Organization and Career Development

13UY0165-6/A1 OCCUPATIONAL HEALTH AND SAFETY, QUALITY, ENVIRONMENTAL PROTECTION, WORK ORGANIZATION, AND PROFESSIONAL DEVELOPMENT QUALIFICATION UNIT

|  |  |  |
| --- | --- | --- |
| 1 | NAME OF THE QUALIFICATION UNIT | Occupational Health and Safety, Quality, Environmental Protection, Work Organization, and Career Development |
| 2 | REFERENCE CODE | 13UY0165-6/A1 |
| 3 | LEVEL | 6 |
| 4 | CREDIT VALUE | - |
| 5 | A)DATE OF PUBLICATION | 12/06/2013 |
| B)REVISION NO | 00 |
| C) REVISION DATE | - |
| 6 | OCCUPATIONAL STANDARD FORMING THE BASIS FOR THE QUALIFICATION UNIT |
| System Manager (Level 6) National Occupation Standard 13UMS0289-6 |
| 7 | LEARNING OUTCOMES |
| **Learning Outcome 1:** Describes OHS measures.Performance Criteria:1. Describes the measures to be taken against risks and hazardous situations.
2. Describes the OHS measures to be followed by the workers.
3. Describes the OHS measures to be followed relating to the working area.
4. Describes the measures to be applied in emergency cases.

**Learning Outcome 2:** Describes the environmental protection measures.Performance Criteria:1. Describes the environmental risks relating to the processes.
2. Describes how to apply the environmental protection measures.
3. Describes how to efficiently utilize the resources of the enterprise.

**Learning Outcome 3:** Describes the quality practices.Performance Criteria:* 1. Describes how to implement the quality checks and the standard conformity tests on the works performed.
	2. Lists the things to do in order to improve the processes as well as to prevent the reoccurrence of the faults and mistakes.

**Learning Outcome 4:** Describes how to carry out the work organization.Performance Criteria:1. Describes how to issue work commands.
2. Lists the things to consider when planning the work.
3. Describes how to direct the personnel under his/her responsibility.
4. Describes how the necessary tools and equipment for the operations will be provided.
5. Describes how to arrange the working area in conformance with the nature of the work.
6. Describes how to keep the forms and registrations to be filled out regarding the operations conducted.
7. Describes how to carry out briefing and reporting to top management.
8. Describes the activities to be performed in coordination with other professional elements.
9. Describes how to perform the digital archiving.
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| **Learning Outcome 5:** Describes the activities to carry out for career development.Performance Criteria:1. Describes the activities to be performed for individual professional development.
2. Describes how to ensure the training of the personnel in accordance with the operation rules and methods.
3. Describes the points to pay attention while participating to the on-the-job training of the personnel.
 |
| 8 | ASSESSMENT |
| **8 a) Theoretical Examination** |
| **T1**: Test examinations are used for assessment. The examination can include multiple-choice questions with a single answer, multiple-choice questions with multiple answers and true-false questions. The examination can be performed in writing as well as with a computerized medium using CBT/IBT system. If the IBT system is used; questions in the form of true-false list, matching and ordering can also be used. The participant must be directed a minimum of 20 questions with equal points and the participant must answer correctly at least 70% of the questions. The questions must be prepared in such a way to cover the learning outcomes and the "Knowledge" checklist given in ANNEX 13UY0165-6/A1-2. Average time per question must be foreseen as 1 to 1.5 minutes. |
| **8 b) Performance Based Examination** |
| No performance based examination is foreseen. |
| 8 c) Other Conditions Related to Assessment |
| Candidate must succeed at each of the required examinations for obtaining the Qualification Certificate within a period of one year. In case the period exceeds one year, the candidate will have to retake the other exams at which he/she succeeded, as well. |
| 9 | QUALIFICATION DEVELOPMENT INSTITUTION(S) | TUBIDER IT Sector Association |
| 10 | SECTOR COMMITTEE TO VERIFY QUALIFICATION | VQA's Information Technologies Sector Committee |
| 11 | APPROVAL DATE AND NUMBER OF VQA's BOARD OF DIRECTORS  | 12/06/2013 - 2013/45 |

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ANNEXES

ANNEX 13UY0165-6/A1-1: Information over Recommended Education for the Qualification Unit

For this unit, it is recommended to complete a training program that includes the following content.

**Content of Training:**

Occupational Health and Safety

IT Technician Occupation and Fundamentals of Working Safety

Basic Occupational Health and Safety Legislation

Basic Employment Legislation

Basic Environment Legislation

Environmental Protection Measures

Appropriate Safety and Environmental Procedures

Preparation of the Working Space

Arrangement of the Working Space

Business Planning

Management of Team Work / Task Distribution

Ensuring the Efficiency of the Business Resources

Quality Management System

Registration, Reporting and Archiving Activities

Coordination with Other Professional Elements

ANNEX 13UY0165-6/A1-2: Checklist to be used in the Assessment of the Qualification Unit

**a) KNOWLEDGE**

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| --- | --- | --- | --- | --- |
| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.1 | Describes the activities to which he/she will contribute for the reduction of the danger and risk factors (evaluation of the dangers, notification of the dangers to the officer in charge/chief, performance of the tasks during the operations) | A.1.1A.1.2A.1.3 | 1.1 | T1 |
| BG.2 | Describes how to use the personal protective equipment that is provided according to the nature of the work to be protected against unavoidable risks, in accordance with the instructions. | A.2.1 | 1.2 | T1 |
| BG.3 | Lists the first aid and emergency response instruments. | A.2.2 | 1.2 | T1 |
| BG.4 | Describes the desk work rules (adjustment of the monitor height and length, resolution and brightness). | A.2.3A.2.4 | 1.2 | T1 |
| BG.5 | Describes the desk work rules (correct sitting posture at the computer, continuous sitting time and break intervals). | A.2.5A.2.6 | 1.2 | T1 |
| BG.6 | Describes the required thermal comfort conditions at the workplace. | A.2.5A.2.6 | 1.2 | T1 |
| BG.7 | Describes how to inspect, with and without a plan, the respect of the employees to the correct PPE use, application of occupational safety measures and OHS rules, in accordance with the related instructions.  | A.2.7 | 1.2 | T1 |

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| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.9 | Describes the aspects to be paid attention while placing the signs and signboards about the health and safety at work to the related spaces at the workplace in accordance with the instructions. | A.3.1 | 1.3 | T1 |
| BG.10 | Describes the aspects to be paid attention while locating the OHS tools and equipment at the related workplace in accordance with the instructions.  | A.3.2 | 1.3 | T1 |
| BG.11 | Describes how to apply specific measures for the work such as air conditioning, heating & cooling, and lightening before the start of the operation and in accordance with the instructions. | A.3.3 | 1.3 | T1 |
| BG.12 | Describes how to respect the specific safe working hours determined in the instructions. | A.3.4 | 1.3 | T1 |
| BG.13 | Describes how to use the tools, instruments and equipment to be used for the operations in accordance with the safety instructions. | A.3.5 | 1.3 | T1 |
| BG.14 | Describes the emergency situation measures to be applied in case of emergency cases (participation to the emergency case team exercises, performance of given tasks, notification to the related unit in case of emergency). | A.4.1A.4.2A.4.3 | 1.4 | T1 |
| BG.15 | Describes the emergency case rules and methods specific to the operation applied. | A.4.4 | 1.4 | T1 |
| BG.16 | Describes how to apply and coordinate the methods and rules regarding the exit and escape of the employees under his/her supervision in case of emergency.  | A.4.5 | 1.4 | T1 |
| BG.17 | Describes how to evaluate the environmental effects and potential dangers of the work spaces where the operations will be performed and the tasks to be carried out.  | B.1.1 | 2.1 | T1 |
| BG.18 | Describes the method to notify the related unit/official in charge or chief about the dangers and risks notified and determined and not mentioned in the instructions, along with a suggestion of measure. | B.1.2 | 2.1 | T1 |
| BG.19 | Describes the activities to be performed in order to reduce the environmental danger sources and risk factors identified at the workplace. | B.1.3 | 2.1 | T1 |
| BG.20 | Describes how to ensure taking measures regarding the potential environmental effects and risks that could arise during the performance of work, in accordance with the operation instructions. | B.2.1 | 2.2 | T1 |
| BG.21 | Describes how to ensure taking the emergency measures regarding the removal of hazardous outputs that might arise despite the measures taken, in accordance with the operation rules and technical methods.  | B.2.2 | 2.2 | T1 |
| BG.22 | Describes the disposal methods for the wastes produced during the performance of the work, in accordance with the operation instructions.  | B.2.3 | 2.2 | T1 |
| BG.23 | Describes the activities to be carried out in order to take safe and healthy working measures against the functions of the used tools, instruments and equipment that might create negative effects for the environment.  | B.2.4 | 2.2 | T1 |

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| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.25 | Describes the economic and efficient use methods of the operation resources (energy, consumables, time, equipment, tools, etc.) during the work processes. | B.3.1B.3.2B.3.3 | 2.3 | T1 |
| BG.26 | Describes how to inspect, with and without a plan, the respect of the employees to the efficient use of operation resources in accordance with the related instructions. | B.3.4 | 2.3 | T1 |
| BG.27 | Describes how to implement the quality assurance rules and methods of the operation in accordance with the instructions specified in the task forms. | C.1.1 | 3.1 | T1 |
| BG.28 | Describes how to operate the office tools and equipment used in accordance with the terms specified in the quality assurance rules and methods. | C.1.2 | 3.1 | T1 |
| BG.29 | Describes how to check the conformity of the tasks undertaken by him/her with the standards. | C.1.3 | 3.1 | T1 |
| BG.30 | Describes how to fill out and ensure the filling of forms about the quality management system related to the work. | C.1.4 | 3.1 | T1 |
| BG.31 | Describes the method to follow for the errors and defects determined during the performance of work. | C.2.1 | 3.2 | T1 |
| BG.32 | Describes how to conduct the examination and evaluation activities regarding the determination of the reasons for errors and faults. | C.2.2 | 3.2 | T1 |
| BG.33 | Describes the method to follow for evaluating the observations made by himself/herself and the teams under his/her supervision regarding the improvement of work processes and the removal of the errors as well as his/her opinions and suggestions. | C.2.3 | 3.2 | T1 |
| BG.34 | Describes how to implement or ensure the implementation of the methods and rules of the operation regarding the removal of errors and defects. | C.2.4 | 3.2 | T1 |
| BG.35 | Describes the method to follow about the errors and defects that are not under his/her authority or that cannot be removed. | C.2.5 | 3.2 | T1 |
| BG.36 | Describes the process of issuing the work commands (reception of work requests, evaluation of the requests by controlling the resources, adding the requests to the work calendar, designation and coding for each request, allocation of responsible personnel, communication of work commands, evaluation with the responsible personnel about the work commands). | D.1.1D.1.2D.1.3D.1.4D.1.5D.1.6D.1.7 | 4.1 | T1 |
| BG.37 | Describes how to set up the work plan in accordance with the operation format and according to the existing work force and time capacity, on the basis of the ordering made and estimated task periods that he/she determined. | D.2.1 | 4.2 | T1 |
| BG.38 | Describes the points to pay attention while drawing up his/her own individual work plan. | D.2.2 | 4.2 | T1 |

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| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.40 | Describes when to revise the work plan (if necessary, according to the change of conditions and the guidance of the superior).  | D.2.4 | 4.2 | T1 |
| BG.41 | Describes how to make the work distribution among the teams/personnel according to the approved work plan.  | D.3.1 | 4.3 | T1 |
| BG.42 | Describes how to inspect the tasks performed.  | D.3.2 | 4.3 | T1 |
| BG.43 | Describes when to supervise the tasks according to the characteristics of the works.  | D.3.3 | 4.3 | T1 |
| BG.44 | Describes how to carry out the stock follow-up within the scope of the warehouse under his/her responsibility (in accordance with the operation rules and methods and according to the specified criteria for the consumables, equipment and tools).  | D.4.1 | 4.4 | T1 |
| BG.45 | Describes the way to follow for making a request of material, equipment, and service (requesting from the related official in charge or superior according to the stock follow-up and work plan).  | D.4.2 | 4.4 | T1 |
| BG.46 | Describes how he/she will support the reception and/or delivery procedures of the material, equipment and service procured.  | D.4.3 | 4.4 | T1 |
| BG.47 | Describes how he/she will make the tools, instruments and equipment related to the work ready for use in accordance with their technical instructions by checking their working status.  | D.4.4 | 4.4 | T1 |
| BG.48 | Describes the method to follow for controlling the calibration and registrations of the equipment and meeting their measurement needs, if necessary.  | D.4.5 | 4.4 | T1 |
| BG.49 | Describes how to ensure maintaining the tools, instruments and equipment used in a clean and functional state.  | D.4.6 | 4.4 | T1 |
| BG.50 | Describes how to determine the characteristics of the work place and the scope of the work points by observing the work place, in order to maintain the continuous and proper performance of work.  | D.5.1 | 4.5 | T1 |
| BG.51 | Describes how to arrange the work space in a way that will meet the proper safety and technical conditions of the related work in accordance with its scope and specified characteristics.  | D.5.2 | 4.5 | T1 |
| BG.52 | Describes the activities to be carried out regarding the materials in the work place that are not related to the work (removal or enabling the removal from the work place).  | D.5.3 | 4.5 | T1 |
| BG.53 | Lists the aspects to pay attention while defining the locations of the tools, instruments and equipment related to the work place.  | D.5.4 | 4.5 | T1 |
| BG.54 | Describes how to conduct the activities related to the standardization of the work place and the improvement of negative conditions.  | D.5.5 | 4.5 | T1 |
| BG.55 | Lists the points to pay attention while ensuring the cleaning of the work place at the end of the work (cleaning according to the characteristics and effects of the work, and the related methods).  | D.5.6 | 4.5 | T1 |
| BG.56 | Describes the tasks to be carried out for the electric tools, instruments and equipment in the work place which are not used.  | D.5.7 | 4.5 | T1 |

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| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.58 | Describes how to ensure filling out the forms about work order, wastage/defect, measurement, etc. in accordance with the operation formats.  | D.6.1 | 4.6 | T1 |
| BG.59 | Describes the aspects to pay attention while controlling the forms filled out by the teams under his/her supervision.  | D.6.2D.6.3 | 4.6 | T1 |
| BG.60 | Describes how to prepare the reports about the outputs of the tasks undertaken.  | D.7.1 | 4.7 | T1 |
| BG.61 | Describes the way to follow about the tasks that could not have been realized (reporting to the superior along with the evaluation of the reasons).  | D.7.2 | 4.7 | T1 |
| BG.62 | Describes the way to follow about the realized tasks (informing the requesting unit in writing and/or orally).  | D.7.3 | 4.7 | T1 |
| BG.63 | Describes how to notify (in writing and/or orally) the superiors about the faults in accordance with the work place rules and methods.  | D.7.4 | 4.7 | T1 |
| BG.64 | Describes the method to follow for the tasks regarding the establishment of the electricity that is required for the work place or the work conducted (enabling the performance of such procedures by contacting the authorized professional).  | D.8.1 | 4.8 | T1 |
| BG.65 | Describes the way to follow for the tasks regarding the environmental regulators such as heating, cooling and moisture (enabling the performance of such procedures by contacting the authorized professional).  | D.8.2 | 4.8 | T1 |
| BG.66 | Describes the way to follow for the tasks regarding the telephone lines and internet connection (enabling the performance of such procedures by contacting the authorized professional).  | D.8.3 | 4.8 | T1 |
| BG.67 | Describes the way to follow for the provision of computer equipment and software (enabling the performance of the provision tasks by contacting the authorized professional in the procurement field).  | D.8.4 | 4.8 | T1 |
| BG.68 | Describes the method to follow for the intermediate or advanced level complicated software configuration tasks in order to meet the user needs (enabling the performance of such tasks by contacting the authorized professional in the field).  | D.8.5 | 4.8 | T1 |
| BG.69 | Describes how to ensure maintaining the software to be used at the work process in a safe and up-to-date state.  | D.9.1 | 4.9 | T1 |
| BG.70 | Explains the archiving process of the resource materials such as reports, forms, etc. that result from the work processes for technical transfer in subsequent levels, in accordance with the operation rules and methods.  | D.9.2 | 4.9 | T1 |
| BG.71 | Describes how to ensure implementing the safety and protection measures of the digital archive.  | D.9.3 | 4.9 | T1 |

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| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.72 | Describes the activities about the individual professional development (identification of self-training needs within the frame of daily experiences and observations, making a training request, monitoring the training programs in his/her field, giving feedback and suggestions about the training activities he/she attended). | L.1.1L.1.2L.1.3L.1.4 | 5.1 | T1 |
| BG.73 | Describes how to follow up the professional and technological innovations (from resources such as periodicals, Internet, magazine; from the publications of the related units of the operation and external resources).  | L.2.1L.2.2 | 5.1 | T1 |
| BG.74 | Describes the way to follow regarding the sharing and reflection of obtained information and documents to the work plan.  | L.2.3L.2.4 | 5.1 | T1 |
| BG.75 | Describes how to ensure the identification of training needs of the unit personnel about the knowledge, skills, professional behaviors, and work habits.  | L.3.1 | 5.2 | T1 |
| BG.76 | Describes the aspects to pay attention while communicating the training needs determined to the related unit.  | L.3.2 | 5.2 | T1 |
| BG.77 | Describes how to ensure the participation of his/her personnel to the trainings planned.  | L.3.3 | 5.2 | T1 |
| BG.78 | Describes the aspects to pay attention while communicating the work instructions, information and experiences regarding the tasks to be performed to the unit personnel.  | L.4.1 | 5.3 | T1 |
| BG.79 | Describes the aspects to pay attention while showing the application of the work to be carried out.  | L.4.2 | 5.3 | T1 |
| BG.80 | Describes the points to pay attention while sharing the existing documents with the personnel.  | L.4.3 | 5.3 | T1 |
| BG.81 | Describes the points to pay attention while monitoring the personnel during the work and correcting the negative aspects.  | L.4.4 | 5.3 | T1 |

**b) SKILLS AND COMPETENCES**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Skill and Competence Description | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| - | - | - | - | - |

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13UY0165-6/A2 Fundamentals of Computer Hardware and Software

Date of Publication: 12/06/2013 Rev. No:00

13UY0165-6/A2 FUNDAMENTALS OF COMPUTER HARDWARE AND SOFTWARE QUALIFICATION

UNIT

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| 1 | NAME OF THE QUALIFICATION UNIT | Fundamentals of Computer Hardware and Software |
| 2 | REFERENCE CODE | 13UY0165-6/A2 |
| 3 | LEVEL | 6 |
| 4 | CREDIT VALUE | - |
|  | A)DATE OF PUBLICATION | 12/06/2013 |
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|  | C) REVISION DATE | - |
| 6 | OCCUPATIONAL STANDARD FORMING THE BASIS FOR THE QUALIFICATION UNIT |
| System Manager (Level 6) National Occupation Standard 13UMS0289-6 |
| 7 | LEARNING OUTCOMES |
| **Learning Outcome 1**: Explains the fundamentals of the computer hardware.Performance Criteria:1. Explains the measurement techniques for electricity, electronics and telecommunication.
2. Describes the main components of computers and servers.
3. Describes the characteristics of computer cases and energy equipment.
4. Describes the connection types and their main characteristics.
5. Describes the hardware characteristics of storing units.

**Learning Outcome 2**: Explains the fundamentals of computer software.Performance Criteria:1. Describes the software concept at the computer.
2. Describes the classifications of operating systems and their main characteristics.
3. Describes the main uses of word processing, calculating and presentation software products.
4. Describes electronic mail, instant messaging and Internet use.

**Learning Outcome 3:** Describes the fundamentals of database.Performance Criteria:1. Describes the concept and types of database.
2. Describes the database models.
3. Describes the fundamentals of database security.
 |
| 8 | ASSESSMENT |
| 8 a) Theoretical Examination |
| T1: Test examinations are used for assessment. The examination can include multiple-choice questions with a single answer, multiple-choice questions with multiple answers and true-false questions. The examination can be performed in writing as well as with a computerized medium using CBT/IBT system. If the IBT system is used; questions in the form of true-false list, matching and ordering can also be used. The participant must be directed a minimum of 15 questions with equal points and the participant must answer correctly at least 70% of the questions. The questions must be prepared in such a way to cover the learning outcomes and the “Knowledge” checklist given in ANNEX 13UY0165-6/A2-2 . Average time per question must be foreseen as 1 to 1.5 minutes. |
| 8 b) Performance Based Examination |
| No performance based examination is foreseen. |

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|  |
| --- |
| 8 c) Other Conditions Related to Assessment |
| One must succeed at each of the required examinations for obtaining the Qualification Certificate within a period of one year. In case the period exceeds one year, the participant will have to retake the other exams at which he/she succeeded, as well.  |
| 9 | QUALIFICATION DEVELOPMENT INSTITUTION(S)  | TUBIDER IT Sector Association |
| 10 | SECTOR COMMITTEE TO VERIFY QUALIFICATION | VQA's Information Technologies Sector Committee |
| 11 | APPROVAL DATE AND NUMBER OF VQA's BOARD OF DIRECTORS  | 12/06/2013 - 2013/45 |

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ANNEXES

ANNEX 13UY0165-6/A2-1: Information over Recommended Education for the Qualification Unit

For this unit, it is recommended to complete a training program that includes the following content.

**Content of Training:**

Computer Literacy Office Software Solutions

Computer Form Factors and System Cases

Basic Electricity Knowledge and Computer Power Supplies

Storage Technologies and Hardware Products

Operating Systems

Server Operating Systems

Fundamentals of Database

ANNEX 13UY0165-6/A2-2: Checklist to be used in the Assessment of the Qualification Unit

**a) KNOWLEDGE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.1 | Describes the current and voltage concepts (DC (Direct Current) and AC (Alternating Current)) with electricity and electro mechanics knowledge.  | 3.3.15 | 1.1 | T1 |
| BG.2 | Lists the tools used in the measurement of current and voltage with electricity and electro mechanics knowledge.  | 3.3.15 | 1.1 | T1 |
| BG.3 | Describes the concept of signal (sound frequencies, radio frequencies, etc.) using his/her knowledge of electronics, electronic circuit elements and digital electronics.  | 3.3.16 | 1.1 | T1 |
| BG.4 | Compares the characteristics of sound, video and data signals and to list the differences using his/her knowledge of electronics, electronic circuit elements and digital electronics.  | 3.3.16 | 1.1 | T1 |
| BG.5 | Describes the concepts of baseband and broadband using his/her knowledge of electronics, electronic circuit elements and digital electronics.  | 3.3.16 | 1.1 | T1 |
| BG.6 | Describes the digital to analog and analog to digital conversion logic using his/her knowledge of electronics, electronic circuit elements and digital electronics.  | 3.3.16 | 1.1 | T1 |
| BG.7 | Describes the voltage and level (dB (decibel), signal power) measurement using his/her knowledge of electronics, electronic circuit elements and digital electronics.  | 3.3.16 | 1.1 | T1 |
| BG.8 | Describes the wide band and selective band measurements using his/her knowledge of electronics, electronic circuit elements and digital electronics.  | 3.3.16 | 1.1 | T1 |
| BG.9 | Describes the distortion measurement using his/her knowledge of electronics, electronic circuit elements and digital electronics.  | 3.3.16 | 1.1 | T1 |
| BG.10 | Describes the PCM (Pulse Code Modulation) measurement techniques using his/her knowledge of electronics, electronic circuit elements and digital electronics.  | 3.3.16 | 1.1 | T1 |

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Description of Knowledge | NOS Related Dept | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.11 | Describes digital signal transmission measurement using his/her knowledge of electronics, electronic circuit elements and digital electronics.  | 3.3.16 | 1.1 | T1 |
| BG.12 | Describes the classifications of computer types using his/her knowledge of computer hardware and peripheral devices.  | 3.3.11 | 1.2 | T1 |
| BG.13 | Describes various fundamental classifications of computer and server components (Processor architecture (RISC, CISC), Server Type & Single User) using his/her knowledge of computer hardware and peripheral devices.  | 3.3.11 | 1.2 | T1 |
| BG.14 | Describes different classification and performance indicators for the processors (Single, Multi Processors, Multicore, stepping, cache levels, Bus Types & Speeds, VRMs, Execute disable (XD) or not execute (NX), Hyper threading etc.) using his/her knowledge of computer hardware and peripheral devices.  | 3.3.11 | 1.2 | T1 |
| BG.15 | Describes the server motherboard classifications (Dip switches /jumpers, BIOS, Connectors), their main characteristics and working principle using his/her knowledge of computer hardware and peripheral devices.  | 3.3.11 | 1.2 | T1 |
| BG.16 | Describes the computer bus structure (HBA, PCI, PCIe, PCIx, AGP, ISA) using his/her knowledge of computer hardware and peripheral devices.  | 3.3.11 | 1.2 | T1 |
| BG.17 | Describes the main characteristics and types of memory units (DDR, DDR2, DDR3 etc.) using his/her knowledge of computer hardware and peripheral devices.  | 3.3.11 | 1.2 | T1 |
| BG.18 | Describes the types and main characteristics of the memory units used in the server systems (ECC, non ECC, Registered, non-registered, fully buffered etc.) using his/her knowledge of computer hardware and peripheral devices.  | 3.3.11 | 1.2 | T1 |
| BG.19 | Describes the memory compatibility (Memory pairing, speed, size, pins, CAS Latency, Timing, Vendor Specific memory etc.) using his/her knowledge of computer hardware and peripheral devices.  | 3.3.11 | 1.2 | T1 |
| BG.20 | Describes the computer display hardware products and their working principles using his/her knowledge of computer hardware and peripheral devices.  | 3.3.11 | 1.2 | T1 |
| BG.21 | Describes the main characteristics of network cards and similar add-on cards using his/her knowledge of computer hardware and peripheral devices.  | 3.3.11 | 1.2 | T1 |
| BG.22 | Describes the computer peripheral devices (printer, scanner, keyboard, mouse, monitor, speakers, microphone, card reader, biometric devices, tablets, etc.) and their working principles using his/her knowledge of computer hardware and peripheral devices.  | 3.3.11 | 1.2 | T1 |
| BG.23 | Describes the main characteristics of Hardware Compatibility List (HCL) (Vendor standards for hardware, Memory and processor compatibility, Expansion cards compatibility, Virtualization requirements etc.) using his/her knowledge of computer hardware and peripheral devices.  | 3.3.11 | 1.2 | T1 |
| BG.24 | Describes the function and characteristics of diagnostic software products using his/her knowledge of system and application software products.  | 3.3.36 | 1.2 | T1 |

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.25 | Describes various computer case types using his/her knowledge of computer hardware and peripheral devices. | 3.3.11 | 1.3 | T1 |
| BG.26 | Describes the power supply hardware products used in the computer systems and their main characteristics using his/her knowledge of computer hardware and peripheral devices. | 3.3.11 | 1.3 | T1 |
| BG.27 | Describes the characteristics and the use of uninterruptible power supplies using his/her knowledge of computer hardware and peripheral devices. | 3.3.11 | 1.3 | T1 |
| BG.28 | Lists the aspects to pay attention while using the power supply equipment using his/her knowledge of computer hardware and peripheral devices. | 3.3.11 | 1.3 | T1 |
| BG.29 | Describes the working principles of case and cooling equipment (Fans, Water cooled, Passive & Active PFC, Shroud, Ducts, Redundant cooling, Hot swappable, Ventilation etc.) using his/her knowledge of computer hardware and peripheral devices. | 3.3.11 | 1.3 | T1 |
| BG.30 | Describes the differences of server cases (Redundant power, Shut off switches-chassis intrusion, Power buttons, Reset buttons, Diagnostic LEDs , Expansion bays etc.) using his/her knowledge of computer hardware and peripheral devices. | 3.3.11 | 1.3 | T1 |
| BG.31 | Describes the working principles of USB communication technology using his/her knowledge of network interfaces and communication standards. | 3.3.1 | 1.4 | T1 |
| BG.32 | Describes the working principles of fire wire communication technology using his/her knowledge of network interfaces and communication standards. | 3.3.1 | 1.4 | T1 |
| BG.33 | Describes the working principles of SCSII communication technology using his/her knowledge of network interfaces and communication standards. | 3.3.1 | 1.4 | T1 |
| BG.34 | Describes the working principles of IEEE1394 communication technology using his/her knowledge of network interfaces and communication standards. | 3.3.1 | 1.4 | T1 |
| BG.35 | Describes the differences between serial and parallel communication using his/her knowledge of network interfaces and communication standards. | 3.3.1 | 1.4 | T1 |
| BG.36 | Describes the working principles of fiber channel communication technology using his/her advanced knowledge of fiber optic cable procedures. | 3.3.20 | 1.4 | T1 |
| BG.37 | Lists the transmission medium types (copper, fiber, wireless, etc.) using his/her knowledge of network equipment and cable systems. | 3.3.2 | 1.4 | T1 |
| BG.38 | Describes the structure and working principle of hard disks using his/her knowledge of computer hardware and peripheral devices. | 3.3.11 | 1.5 | T1 |
| BG.39 | Describes the types and main characteristics of hard disks using his/her knowledge of computer hardware and peripheral devices. | 3.3.11 | 1.5 | T1 |
| BG.40 | Describes the communication standards of computer storage hardware products (IDE, SCSI, SATA, PATA etc.) using his/her knowledge of computer hardware and peripheral devices. | 3.3.11 | 1.5 | T1 |
| BG.41 | Describes different configuration types and performance indicators for hard disks using his/her knowledge of computer hardware and peripheral devices. | 3.3.11 | 1.5 | T1 |
| BG.42 | Describes the storage standards and working principles of optical drive types (DVD, DVD-R, Blue-Ray etc.) using his/her knowledge of computer hardware and peripheral devices. | 3.3.11 | 1.5 | T1 |
| BG.43 | Describes the characteristics of backup tape technology using his/her knowledge of computer hardware and peripheral devices. | 3.3.11 | 1.5 | T1 |

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.44 | Describes the types and main characteristics of flash storage units using his/her knowledge of computer hardware and peripheral devices.  | 3.3.11 | 1.5 | T1 |
| BG.45 | Lists the data storage standards used by the operating systems using his/her knowledge of computer hardware and peripheral devices.  | 3.3.11 | 1.5 | T1 |
| BG.46 | Describes the storage devices management in different operating systems using his/her knowledge of computer hardware and peripheral devices.  | 3.3.11 | 1.5 | T1 |
| BG.47 | Describes the principles of data correction and recovery using his/her knowledge of computer hardware and peripheral devices.  | 3.3.11 | 1.5 | T1 |
| BG.48 | Describes the main characteristics of server storage units (SCSI low voltage / high voltage (LVD/HVD), SCSI IDs, Active Passive termination, SATA, SAS etc.) using his/her knowledge of computer hardware and peripheral devices. | 3.3.11 | 1.5 | T1 |
| BG.49 | Describes the RAID Technologies and their characteristics (How Spare, Software & hardware RAID, Cache read/write levels (data loss potential), Performance benefits and tradeoffs etc.) using his/her knowledge of computer hardware and peripheral devices.  | 3.3.11 | 1.5 | T1 |
| BG.50 | Describes the operating logic of the software solutions in the computer system using his/her knowledge about the installation, configuration and use of computer operating systems. | 3.3.12 | 2.1 | T1 |
| BG.51 | Describes the main characteristics of software products using his/her knowledge about the installation, configuration and use of computer operating systems. | 3.3.12 | 2.1 | T1 |
| BG.52 | Lists the software packages and applications that are commonly used in computer systems using his/her knowledge about the installation, configuration and use of computer operating systems.  | 3.3.12 | 2.1 | T1 |
| BG.53 | Describes the functions of operating systems using his/her knowledge about the installation, configuration and use of computer operating systems.  | 3.3.12 | 2.2 | T1 |
| BG.54 | Describes the classifications and main characteristics of operating systems using his/her knowledge about the installation, configuration and use of computer operating systems.  | 3.3.12 | 2.2 | T1 |
| BG.55 | Describes the index and folder structure and systems used in different operating systems (FAT, FAT32, NTFS, VMFS, ZFS, EXT3 etc.) using his/her knowledge about the installation, configuration and use of computer operating systems.  | 3.3.12 | 2.2 | T1 |
| BG.56 | Describes the main use of the most common operating systems using his/her knowledge about the installation, configuration and use of computer operating systems.  | 3.3.12 | 2.2 | T1 |
| BG.57 | Lists the specific operating systems using his/her knowledge about the installation, configuration and use of computer operating systems. | 3.3.12 | 2.2 | T1 |
| BG.58 | Lists the pros and cons of using operating systems with open-source codes using his/her knowledge about the installation, configuration and use of computer operating systems. | 3.3.12 | 2.2 | T1 |
| BG.59 | Lists the pros and cons of using operating systems with closed source codes using his/her knowledge about the installation, configuration and use of computer operating systems. | 3.3.12 | 2.2 | T1 |

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Description of Knowledge | NOS Related Dept. | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.60 | Describes the check of compatibility and interoperability of operating systems using his/her knowledge about the installation, configuration and use of computer operating systems.  | 3.3.12 | 2.2 | T1 |
| BG.61 | Describes the installation, configuration and updating processes of the operating systems using his/her knowledge about the installation, configuration and use of computer operating systems.  | 3.3.12 | 2.2 | T1 |
| BG.62 | Describes the starting and stopping of the servers using his/her knowledge about the installation, configuration and use of computer operating systems.  | 3.3.12 | 2.2 | T1 |
| BG.63 | Describes the reading and writing permission settings and shared sources using his/her knowledge about the installation, configuration and use of computer operating systems.  | 3.3.12 | 2.2 | T1 |
| BG.64 | Describes the security methods used for the operating system (software firewall, antivirus, antispyware programs etc.) using his/her knowledge about the installation, configuration and use of computer operating systems.  | 3.3.12 | 2.2 | T1 |
| BG.65 | Describes the function of the scheduler in the operating system using his/her knowledge about the installation, configuration and use of computer operating systems.  | 3.3.12 | 2.2 | T1 |
| BG.66 | Describes the concepts of synchronization and semaphore in the operating system using his/her knowledge about the installation, configuration and use of computer operating systems.  | 3.3.12 | 2.2 | T1 |
| BG.67 | Describes operating system management (monitoring, process control, upgrading, patch etc.) using his/her knowledge about the installation, configuration and use of computer operating systems.  | 3.3.12 | 2.2 | T1 |
| BG.68 | Describes the types and main uses of word processing software solutions using his/her knowledge of system and application software products.  | 3.3.36 | 2.3 | T1 |
| BG.69 | Describes the types and main uses of calculating software solutions using his/her knowledge of system and application software products.  | 3.3.36 | 2.3 | T1 |
| BG.70 | Describes the types and main uses of presentation software solutions using his/her knowledge of system and application software products. | 3.3.36 | 2.3 | T1 |
| BG.71 | Describes the types and main uses of web scanner software solutions using his/her knowledge of system and application software products. | 3.3.36 | 2.4 | T1 |
| BG.72 | Describes the types and main uses of electronic mail and instant messaging software solutions using his/her knowledge of system and application software products.  | 3.3.36 | 2.4 | T1 |
| BG.73 | Describes the fundamentals of Internet using his/her knowledge of system and application software products.  | 3.3.36 | 2.4 | T1 |
| BG.74 | Describes the purposes of use of the database using his/her knowledge of database management.  | 3.3.46 | 3.1 | T1 |
| BG.75 | Describes the database types (DB2, Oracle, Access, Microsoft SQL Server etc.) and their main characteristics using his/her knowledge of database management.  | 3.3.46 | 3.1 | T1 |
| BG.76 | Lists the data types of databases using his/her knowledge of database management.  | 3.3.46 | 3.1 | T1 |
| BG.77 | Describes the concept of stored procedure and its purpose of use using his/her knowledge of database management.  | 3.3.46 | 3.1 | T1 |
| BG.78 | Lists the characteristics of database tables using his/her knowledge of database management.  | 3.3.46 | 3.1 | T1 |

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.79 | Describes the task of creating form and reports using his/her knowledge of database management. | 3.3.46 | 3.1 | T1 |
| BG.80 | Describes the data flow modelling using his/her knowledge of database management. | 3.3.46 | 3.1 | T1 |
| BG.81 | Describes the characteristics of associative database using his/her knowledge of database management.  | 3.3.46 | 3.2 | T1 |
| BG.82 | Describes the characteristics of hierarchical database using his/her knowledge of database management.  | 3.3.46 | 3.2 | T1 |
| BG.83 | Describes the characteristics of object-oriented database using his/her knowledge of database management.  | 3.3.46 | 3.2 | T1 |
| BG.84 | Describes the database access control using his/her knowledge of database management.  | 3.3.46 | 3.3 | T1 |
| BG.85 | Describes the simultaneous, multi-user task control using his/her knowledge of database management.  | 3.3.46 | 3.3 | T1 |
| BG.86 | Describes the database backup task using his/her knowledge of database management.  | 3.3.46 | 3.3 | T1 |
| BG.87 | Describes the database recovery task using his/her knowledge of database management.  | 3.3.46 | 3.3 | T1 |

**b) SKILLS AND COMPETENCES**

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Skill and Competence Description | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| - | - | - | - | - |

13UY0165-6/A3 Fundamentals of Network Technologies

Date of Publication: 12/06/2013 Rev. No: 00

13UY0165-6/A3 FUNDAMENTALS OF NETWORK TECHNOLOGIES QUALIFICATION UNIT

|  |  |  |
| --- | --- | --- |
| 1 | NAME OF THE QUALIFICATION UNIT | Fundamentals of Network Technologies |
| 2 | REFERENCE CODE | 13UY0165-6/A3 |
| 3 | LEVEL | 6 |
| 4 | CREDIT VALUE | - |
| 5 | A)DATE OF PUBLICATION | 12/06/2013 |
| B)REVISION NO | 00 |
| C) REVISION DATE | - |
| 6 | OCCUPATIONAL STANDARD FORMING THE BASIS FOR THE QUALIFICATION UNIT |
| System Manager (Level 6) National Occupation Standard 13UMS0289-6 |
| 7 | LEARNING OUTCOMES |
| **Learning Outcome 1**: Explains the fundamentals of the network systems.**Performance Criteria:**1. Describes the main concepts about the computer networks.
2. Describes the computer network architectures and their characteristics.
3. Describes the main network technologies.

**Learning Outcome 1**: Explains the characteristics of network hardware products.**Performance Criteria:**1. Lists the active network hardware devices along with their characteristics.
2. Explains the characteristics of other network hardware products.

**Learning Outcome 3:** Describes the network protocols.Performance Criteria:1. Describes the concepts of network protocol.
2. Describes the OSI model and its layers.
3. Describes the TCP/IP layers and protocols.
4. Describes other network protocols.
 |
| 8 | **ASSESSMENT** |
| 8 a) Theoretical Examination |
| T1: Test examinations are used for assessment. The examination can include multiple-choice questions with a single answer, multiple-choice questions with multiple answers and true-false questions. The examination can be performed in writing as well as with a computerized medium using CBT/IBT system. If the IBT system is used; questions in the form of true-false list, matching and ordering can also be used. The participant must be directed a minimum of 20 questions with equal points and the participant must answer correctly at least 70% of the questions. The questions must be prepared in such a way to cover the learning outcomes and the “Knowledge” checklist given in ANNEX 13UY0165-6/A3-2. Average time per question must be foreseen as 1 to 1.5 minutes. |
| 8 b) Performance Based Examination |
| No performance based examination is foreseen. |
| 8 c) Other Conditions Related to Assessment |
| One must succeed at each of the required examinations for obtaining the Qualification Certificate within a period of one year. In case the period exceeds one year, the participant will have to retake the other exams at which he/she succeeded, as well. |

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| 9 | QUALIFICATION DEVELOPMENT INSTITUTION(S)  | TUBIDER IT Sector Association |
| 10 | SECTOR COMMITTEE TO VERIFY QUALIFICATION | VQA's Information Technologies Sector Committee |
| 11 | APPROVAL DATE AND NUMBER OF VQA's BOARD OF DIRECTORS  | 12/06/2013 - 2013/45 |

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ANNEXES

ANNEX 13UY0165-6/A3-1: Information over Recommended Education for the Qualification Unit

For this unit, it is recommended to complete a training program that includes the following content.

**Content of Training:**

Main Network Concepts

Network Cable Types

Active Network Hardware Devices

Wired and Wireless Network Technologies

Internet Access Devices and Technologies

Network Protocols

OSI Model

ANNEX 13UY0165-6/A3-2: Checklist to be used in the Assessment of the Qualification Unit

**a) KNOWLEDGE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.1 | Describes the basic working principles of the computer networks using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 1.1 | T1 |
| BG.2 | Lists various classification types used for the computer networks using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 1.1 | T1 |
| BG.3 | Describes the characteristics of geographical space network classifications (LAN, WAN, MAN, PAN etc.) using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 1.1 | T1 |
| BG.4 | Describes the characteristics and operating principles of physical network topologies using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 1.1 | T1 |
| BG.5 | Describes the wired network communication standards using his/her knowledge of network interfaces and communication standards. | 3.3.1 | 1.1 | T1 |
| BG.6 | Describes the wireless network communication standards (IEEE 802.11, 15, 16etc.) using his/her knowledge of network interfaces and communication standards.  | 3.3.1 | 1.1 | T1 |
| BG.7 | Describes the concept of Broadband Wireless Access (BWA) using his/her knowledge of network interfaces and communication standards.  | 3.3.1 | 1.1 | T1 |
| BG.8 | Describes the characteristics of wireless local area networks (Wireless LAN) using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 1.1 | T1 |
| BG.9 | Describes the characteristics of the GPS (Global Positioning System) using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 1.1 | T1 |
| BG.10 | Describes the characteristics of client-server based network architecture using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 1.2 | T1 |

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.11 | Describes the characteristics of server-based networks using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 1.2 | T1 |
| BG.12 | Describes the characteristics of peer-to-peer network architecture using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 1.2 | T1 |
| BG.13 | Describes the concept of local area network (LAN) using his/her knowledge of network architectures, topology and management layers. | 3.3.5 | 1.3 | T1 |
| BG.14 | Describes the concept of LAN addressing using his/her knowledge of network architectures, topology and management layers. | 3.3.5 | 1.3 | T1 |
| BG.15 | Describes the purposes of sub-network use and its main characteristics using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 1.3 | T1 |
| BG.16 | Describes the concept of artificial local network using his/her knowledge of network architectures, topology and management layers. | 3.3.5 | 1.3 | T1 |
| BG.17 | Describes the routing and switching configurations of artificial neural networks using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 1.3 | T1 |
| BG.18 | Describes the main characteristics of the Ethernet technology using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 1.3 | T1 |
| BG.19 | Describes the process of termination using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 1.3 | T1 |
| BG.20 | Describes the function of CRC (Cyclic Redundancy Check) codes in the data packages using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 1.3 | T1 |
| BG.21 | Describes the Backbone technology using his/her knowledge of network architectures, topology and management layers. | 3.3.5 | 1.3 | T1 |
| BG.22 | Describes the CSMA (Carrier Sense, Multiple Access/Collision Detection) technique using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 1.3 | T1 |
| BG.23 | Lists the cable types used in the ethernet technologies using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 1.3 | T1 |
| BG.24 | Describes other network technologies (ISDN, ATM, DSL, FDDI etc.) using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 1.3 | T1 |
| BG.25 | Describes the purposes of use and main characteristics of repeaters using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 2.1 | T1 |
| BG.26 | Describes the characteristics of network switch hardware products using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 2.1 | T1 |
| BG.27 | Describes the types and main characteristics of multilayer switch devices using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 2.1 | T1 |
| BG.28 | Describes the types of switch configuration using his/her knowledge of network hardware products and cable systems. | 3.3.2 | 2.1 | T1 |
| BG.29 | Describes the types of multilayer switch configuration using his/her knowledge of network hardware products and cable systems. | 3.3.2 | 2.1 | T1 |
| BG.30 | Describes the purposes of use and main characteristics of the wireless access point device using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 2.1 | T1 |

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| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.31 | Describes the purposes of use and main characteristics of bridges using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 2.1 | T1 |
| BG.32 | Describes the purposes of use and main characteristics of routers using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 2.1 | T1 |
| BG.33 | Describes the characteristics of advanced routers using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 2.1 | T1 |
| BG.34 | Describes the purposes of use and main characteristics of load balance broadband routers using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 2.1 | T1 |
| BG.35 | Describes the purposes of use and main characteristics of bandwidth regulators using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 2.1 | T1 |
| BG.36 | Describes the purposes of use and main characteristics of firewall using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 2.1 | T1 |
| BG.37 | Describes the characteristics of advanced firewalls using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 2.1 | T1 |
| BG.38 | Describes the main characteristics of attack identification and prevention systems using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 2.1 | T1 |
| BG.39 | Describes the main characteristics and working principle of network interface cards using his/her knowledge of network hardware products and cable systems. | 3.3.2 | 2.2 | T1 |
| BG.40 | Describes the concepts of baseband and broadband and their fields of use using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 2.2 | T1 |
| BG.41 | Describes the IEEE 802 network cabling standards using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 2.2 | T1 |
| BG.42 | Describes the characteristics of split band plans using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 2.2 | T1 |
| BG.43 | Describes the connector types used in different network cables using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 2.2 | T1 |
| BG.44 | Describes the concepts of ethernet and MAC address using his/her knowledge of network interfaces and communication standards. | 3.3.1 | 3.1 | T1 |
| BG.45 | Describes the operation method of network address cycle using his/her knowledge of network interfaces and communication standards. | 3.3.1 | 3.1 | T1 |
| BG.46 | Describes the concept of network protocol using his/her knowledge of network interfaces and communication standards. | 3.3.1 | 3.1 | T1 |
| BG.47 | Describes the concept of gateway using his/her knowledge of network interfaces and communication standards. | 3.3.1 | 3.1 | T1 |
| BG.48 | Lists the versions of IP addresses and the related classifications using his/her knowledge of network interfaces and communication standards.  | 3.3.1 | 3.1 | T1 |
| BG.49 | Describes the structures and main characteristics of IP address versions using his/her knowledge of network interfaces and communication standards.  | 3.3.1 | 3.1 | T1 |
| BG.50 | Describes the characteristics of Internet protocol versions (IPv4, IPv6) using his/her knowledge of network interfaces and communication standards.  | 3.3.1 | 3.1 | T1 |

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| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.51 | Describes the characteristics of routing protocols (Router Information Protocol - RIP, Open Shortest Path First -OSPF, Interior Gateway Routing Protocol - IGRP) using his/her knowledge of network interfaces and communication standards.  | 3.3.1 | 3.1 | T1 |
| BG.52 | Describes the OSI model using his/her knowledge of network architectures, topology and management layers. | 3.3.5 | 3.2 | T1 |
| BG.53 | Lists the protocols used in the Application layer of the OSI model along with their main functions using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.2 | T1 |
| BG.54 | Lists the protocols used in the Presentation layer of the OSI model along with their main functions using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.2 | T1 |
| BG.55 | Lists the protocols used in the Session layer of the OSI model along with their main functions using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.2 | T1 |
| BG.56 | Lists the protocols used in the Transport layer of the OSI model along with their main functions using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.2 | T1 |
| BG.57 | Lists the protocols used in the Network layer of the OSI model along with their main functions using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.2 | T1 |
| BG.58 | Lists the protocols used in the Data Link layer of the OSI model along with their main functions using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.2 | T1 |
| BG.59 | Describes the functions of logical link control (LLC) sub-layer using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.2 | T1 |
| BG.60 | Lists the protocols used in the Physical layer of the OSI model along with their main functions using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.2 | T1 |
| BG.61 | Describes the concept of TCP/IP using his/her knowledge of network architectures, topology and management layers. | 3.3.5 | 3.3 | T1 |
| BG.62 | Describes the TCP/IP layers and the relationship between them using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.3 | T1 |
| BG.63 | Describes the purpose of use and characteristics of TCP (Transmission Control Protocol) as one of the TCP/IP protocols using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.3 | T1 |
| BG.64 | Describes the purpose of use and characteristics of UDP (User Datagram Protocol) as one of the TCP/IP protocols using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.3 | T1 |

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| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.65 | Describes the purpose of use and characteristics of ARP (Address Resolution Protocol) as one of the TCP/IP protocols using his/her knowledge of network architectures, topology and management layers. | 3.3.5 | 3.3 | T1 |
| BG.66 | Describes the purpose of use and characteristics of DNS (Domain Name System/Service) as one of the TCP/IP protocols using his/her knowledge of network architectures, topology and management layers. | 3.3.5 | 3.3 | T1 |
| BG.67 | Describes the purpose of use and characteristics of DHCP/BootP (Dynamic Host Configuration Protocol) as one of the TCP/IP protocols using his/her knowledge of network architectures, topology and management layers. | 3.3.5 | 3.3 | T1 |
| BG.68 | Describes the purpose of use and characteristics of FTP (File Transfer Protocol) as one of the TCP/IP protocols using his/her knowledge of network architectures, topology and management layers. | 3.3.5 | 3.3 | T1 |
| BG.69 | Describes the purpose of use and characteristics of HTTP (Hypertext Transfer Protocol) as one of the TCP/IP protocols using his/her knowledge of network architectures, topology and management layers. | 3.3.5 | 3.3 | T1 |
| BG.70 | Describes the purpose of use and characteristics of IMCP (Internet Message Control Protocol) as one of the TCP/IP protocols using his/her knowledge of network architectures, topology and management layers. | 3.3.5 | 3.3 | T1 |
| BG.71 | Describes the purpose of use and characteristics of POP/POP3 (Post Office Protocol/Post Office Protocol v3)as one of the TCP/IP protocols using his/her knowledge of network architectures, topology and management layers. | 3.3.5 | 3.3 | T1 |
| BG.72 | Describes the purpose of use and characteristics of SMTP (Simple Mail Transfer Protocol) as one of the TCP/IP protocols using his/her knowledge of network architectures, topology and management layers. | 3.3.5 | 3.3 | T1 |
| BG.73 | Describes the purpose of use and characteristics of SNMP (Simple Network Management Protocol) as one of the TCP/IP protocols using his/her knowledge of network architectures, topology and management layers. | 3.3.5 | 3.3 | T1 |
| BG.74 | Describes the purpose of use and characteristics of TFTP (Trivial File Transfer Protocol) as one of the TCP/IP protocols using his/her knowledge of network architectures, topology and management layers. | 3.3.5 | 3.3 | T1 |
| BG.75 | Describes the purpose of use and characteristics of TELNET as one of the TCP/IP protocols using his/her knowledge of network architectures, topology and management layers. | 3.3.5 | 3.3 | T1 |
| BG.76 | Describes the functioning of 3-way handshake method using his/her knowledge of network architectures, topology and management layers. | 3.3.5 | 3.3 | T1 |
| BG.77 | Describes the functions of TCP header fields (Source Port, Destination Port, Sequence Number, Acknowledgement Number (ACK), TCP Header Length , Reserved, Flags, Window, Checksum, Urgent Pointer, Options) using his/her knowledge of network architectures, topology and management layers. | 3.3.5 | 3.3 | T1 |

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| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.78 | Describes the network command line applications operating over the TCP/IP using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.3 | T1 |
| BG.79 | Describes the purpose of use of IMAP (Internet Message Access Protocol) using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.4 | T1 |
| BG.80 | Describes the purpose of use of ITP (Ideal Transport Protocol) using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.4 | T1 |
| BG.81 | Describes the purpose of use of L2TP (Layer Two Tunneling Protocol) using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.4 | T1 |
| BG.82 | Describes the purpose of use of LDAP (Lightweight Directory Access Protocol) using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.4 | T1 |
| BG.83 | Describes the purpose of use of LU 6.2 (Advanced Program-to-Program Communications) protocol using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.4 | T1 |
| BG.84 | Describes the purpose of use of NFS (Network File System) protocol using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.4 | T1 |
| BG.85 | Describes the purpose of use of NIS (Network Information System) protocol using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.4 | T1 |
| BG.86 | Describes the purpose of use of NNTP (Network News Transport Protocol - RFC 977) using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.4 | T1 |
| BG.87 | Describes the purpose of use of NTP (Network Time Protocol) using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.4 | T1 |
| BG.88 | Describes the purpose of use of SMB (Server Message Block) protocol using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.4 | T1 |
| BG.89 | Describes the purpose of use of SMS (Systems Management Server) protocol using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.4 | T1 |
| BG.90 | Describes the purpose of use of SOAP (Simple Object Access Protocol) using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.4 | T1 |
| BG.91 | Describes the purpose of use of UDDI (Universal Description, Discovery and Integration) protocol using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.4 | T1 |
| BG.92 | Describes the purpose of use of WSDL (Web Services Description Language) protocol using his/her knowledge of network architectures, topology and management layers.  | 3.3.5 | 3.4 | T1 |
| BG.93 | Lists the other network protocols (IPX SPX, SNA, NetBEUI, etc.) using his/her knowledge of network architectures, topology and management layers. | 3.3.5 | 3.4 | T1 |

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b) SKILLS AND COMPETENCES

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| --- | --- | --- | --- | --- |
| No | Skill and Competence Description | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| - | - | - | - | - |

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13UY0165-6/A4 Fundamentals of Server Systems

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13UY0165-6/A4 FUNDAMENTALS OF SERVER SYSTEMS QUALIFICATION UNIT

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| --- | --- | --- |
| 1 | NAME OF THE QUALIFICATION UNIT | Fundamentals of Server Systems |
| 2 | REFERENCE CODE | 13UY0165-6/A4 |
| 3 | LEVEL | 6 |
| 4 | CREDIT VALUE | - |
| 5 | A)DATE OF PUBLICATION | 12/06/2013 |
| B)REVISION NO | 00 |
| C) REVISION DATE | - |
| 6 | OCCUPATIONAL STANDARD FORMING THE BASIS FOR THE QUALIFICATION UNIT |
| System Manager (Level 6) National Occupation Standard 13UMS0289-6 |
| 7 | LEARNING OUTCOMES |
| **Learning Outcome 1**: Describes the fundamentals of network and server security.Performance Criteria:1. Describes the concepts about the network and server security.
2. Lists the hardware and software security devices/tools used in the network topology.
3. Describes the concepts of local network and remote access security.
4. Describes the wireless network security.

**Learning Outcome 2**: Describes the management, monitoring and application systems in the networks and servers. Performance Criteria:1. Describes the characteristics of network monitoring system.
2. Describes the functions of network management tools.
3. Describes the server test software solutions and their characteristics.
4. Describes the characteristics of server application software solutions.
5. Describes the remote connection types and their main characteristics.

**Learning Outcome 3:** Describes the hardware and software characteristics of the servers.Performance Criteria:1. Describes the server types and server roles according to the purpose of use.
2. Describes the characteristics of network and server devices.
3. Describes the characteristics of server operating systems and software solutions.
 |
| 8 | ASSESSMENT |
| 8 a) Theoretical Examination |
| T1: Test examinations are used for assessment. The examination can include multiple-choice questions with a single answer, multiple-choice questions with multiple answers and true-false questions. The examination can be performed in writing as well as with a computerized medium using CBT/IBT system. If the IBT system is used; questions in the form of true-false list, matching and ordering can also be used. The participant must be directed a minimum of 30 questions with equal points and the participant must answer correctly at least 70% of the questions. The questions must be prepared in such a way to cover the learning outcomes and the “Knowledge” checklist given in ANNEX 13UY0165-6/A4-2. Average time per question must be foreseen as 1 to 1.5 minutes. |
| 8 b) Performance Based Examination |
| No performance based examination is foreseen. |
| 8 c) Other Conditions Related to Assessment |
| One must succeed at each of the required examinations for obtaining the Qualification Certificate within a period of one year. In case the period exceeds one year, the participant will have to retake the other exams at which he/she succeeded, as well. |

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| 9 | QUALIFICATION DEVELOPMENT INSTITUTION(S)  | TUBIDER IT Sector Association |
| 10 | SECTOR COMMITTEE TO VERIFY QUALIFICATION | VQA's Information Technologies Sector Committee |
| 11 | APPROVAL DATE AND NUMBER OF VQA's BOARD OF DIRECTORS  | 12/06/2013 - 2013/45 |

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**ANNEXES**

ANNEX 13UY0165-6/A4-1: Information over Recommended Education for the Qualification Unit

For this unit, it is recommended to complete a training program that includes the following content.

**Content of Training:**

Network and Server Security Network Security Devices Network Security Software Solutions Network and Server Management Tools Network and Server Monitoring Tools Server Systems Server Operating Systems Virtualization Technologies

ANNEX 13UY0165-6/A4-2: Checklist to be used in the Assessment of the Qualification Unit

a) **KNOWLEDGE**

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| No | Information Description | NOS Related Dept | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.1 | Describes the network and server based security concepts with his/her knowledge of using the test and troubleshooting software solutions. | 3.3.43 | 1.1 | T1 |
| BG.2 | Describes the network access security methods with his/her knowledge of using the test and troubleshooting software solutions. | 3.3.43 | 1.1 | T1 |
| BG.3 | Describes the digital certificate concept with his/her knowledge of using the test and troubleshooting software solutions. | 3.3.43 | 1.1 | T1 |
| BG.4 | Describes the security protocols (Secure Socket Layer - SSL, IP security - Ipsec, WEP, Secure Shell - SSH etc.) with his/her knowledge of using the test and troubleshooting software solutions.  | 3.3.43 | 1.1 | T1 |
| BG.5 | Lists the types of malware with his/her knowledge of using the test and troubleshooting software solutions. | 3.3.43 | 1.1 | T1 |
| BG.6 | Describes the concept of social engineering with his/her knowledge of using the test and troubleshooting software solutions.  | 3.3.43 | 1.1 | T1 |
| BG.7 | Describes the functions of firewall with his/her knowledge of using the test and troubleshooting software solutions. | 3.3.43 | 1.2 | T1 |
| BG.8 | Describes the functions of antivirus gateway with his/her knowledge of using the test and troubleshooting software solutions. | 3.3.43 | 1.2 | T1 |
| BG.9 | Describes the functions of anti-spam with his/her knowledge of using the test and troubleshooting software solutions. | 3.3.43 | 1.2 | T1 |
| BG.10 | Describes the functions of content filtering system with his/her knowledge of using the test and troubleshooting software solutions.  | 3.3.43 | 1.2 | T1 |
| BG.11 | Describes the functions of web filtering system with his/her knowledge of using the test and troubleshooting software solutions. | 3.3.43 | 1.2 | T1 |
| BG.12 | Describes the functions of IM (Instant Messaging) filtering system with his/her knowledge of using the test and troubleshooting software solutions.  | 3.3.43 | 1.2 | T1 |

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| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.13 | Describes the functions of demilitarized zone (DMZ) system with his/her knowledge of using the test and troubleshooting software solutions.  | 3.3.43 | 1.2 | T1 |
| BG.14 | Describes the functions of intrusion detection systems (IDS) with his/her knowledge of using the test and troubleshooting software solutions.  | 3.3.43 | 1.2 | T1 |
| BG.15 | Describes the functions of intrusion prevention systems (IPS) with his/her knowledge of using the test and troubleshooting software solutions.  | 3.3.43 | 1.2 | T1 |
| BG.16 | Describes the functions of data loss prevention system with his/her knowledge of using the test and troubleshooting software solutions.  | 3.3.43 | 1.2 | T1 |
| BG.17 | Describes the functions of encryption systems with his/her knowledge of using the test and troubleshooting software solutions.  | 3.3.43 | 1.2 | T1 |
| BG.18 | Describes the concept and characteristics of the VPN (Virtual Private Network) using his/her knowledge of remote management services.  | 3.3.44 | 1.3 | T1 |
| BG.19 | Describes the characteristics of VPN types according to the usage (Site-to-Site VPN, Remote Access VPN) using his/her knowledge of remote management services.  | 3.3.44 | 1.3 | T1 |
| BG.20 | Describes the functions of the NAC (Network Admission Control) using his/her knowledge of remote management services.  | 3.3.44 | 1.3 | T1 |
| BG.21 | Describes the user verification methods using his/her knowledge of remote management services. | 3.3.44 | 1.3 | T1 |
| BG.22 | Describes the characteristics of the wi-fi protected access (WPA) encryption technique using his/her knowledge of remote management services.  | 3.3.44 | 1.4 | T1 |
| BG.23 | Describes the characteristics of the wired equivalent privacy (WEP) encryption technique using his/her knowledge of remote management services.  | 3.3.44 | 1.4 | T1 |
| BG.24 | Describes the characteristics of the 802.1X authentication technique using his/her knowledge of remote management services.  | 3.3.44 | 1.4 | T1 |
| BG.25 | Describes the functions of the access control lists (ACL) using his/her knowledge of remote management services.  | 3.3.44 | 1.4 | T1 |
| BG.26 | Lists the types of alarm with his/her knowledge of using the test and troubleshooting software solutions. | 3.3.43 | 2.1 | T1 |
| BG.27 | Describes the characteristics of restoration protocols with his/her knowledge of using the test and troubleshooting software solutions. | 3.3.43 | 2.1 | T1 |
| BG.28 | Describes the functions and characteristics of the network monitoring software solutions (simple network management protocol, SNMP, OAM&P, etc.) with his/her knowledge of using the test and troubleshooting software solutions.  | 3.3.43 | 2.1 | T1 |
| BG.29 | Describes the functions of ACL (Access Control Listings) with his/her knowledge of using the test and troubleshooting software solutions. | 3.3.43 | 2.2 | T1 |
| BG.30 | Describes the functions of BIND (Berkeley Internet Name Domain) with his/her knowledge of using the test and troubleshooting software solutions.  | 3.3.43 | 2.2 | T1 |
| BG.31 | Describes the functions of ISAM (Indexed Sequential Access Method) with his/her knowledge of using the test and troubleshooting software solutions.  | 3.3.43 | 2.2 | T1 |

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| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.32 | Describes the functions of RMA (Records Management Application) with his/her knowledge of using the test and troubleshooting software solutions.  | 3.3.43 | 2.2 | T1 |
| BG.33 | Describes the functions of RNA (Remote Network Access) with his/her knowledge of using the test and troubleshooting software solutions. | 3.3.43 | 2.2 | T1 |
| BG.34 | Describes the system test procedures with his/her knowledge of using the test and troubleshooting software solutions. | 3.3.43 | 2.3 | T1 |
| BG.35 | Lists the data analysis tools with his/her knowledge of using the test and troubleshooting software solutions. | 3.3.43 | 2.3 | T1 |
| BG.36 | Lists the error types and metric quality identification tools with his/her knowledge of using the test and troubleshooting software solutions.  | 3.3.43 | 2.3 | T1 |
| BG.37 | Lists the regression test software products and their characteristics with his/her knowledge of using the test and troubleshooting software solutions.  | 3.3.43 | 2.3 | T1 |
| BG.38 | Lists the stress test (load test) software products and their characteristics with his/her knowledge of using the test and troubleshooting software solutions.  | 3.3.43 | 2.3 | T1 |
| BG.39 | Describes the characteristics of test tools (WIN Runner, Load Runner) with his/her knowledge of using the test and troubleshooting software solutions.  | 3.3.43 | 2.3 | T1 |
| BG.40 | Describes the availability tests with his/her knowledge of using the test and troubleshooting software solutions. | 3.3.43 | 2.3 | T1 |
| BG.41 | Describes the version control tools with his/her knowledge of using the test and troubleshooting software solutions. | 3.3.43 | 2.3 | T1 |
| BG.42 | Describes the central system management tools with his/her knowledge of using the test and troubleshooting software solutions. | 3.3.43 | 2.3 | T1 |
| BG.43 | Describes the data processing service management tools with his/her knowledge of using the test and troubleshooting software solutions. | 3.3.43 | 2.3 | T1 |
| BG.44 | Describes the data processing management automations with his/her knowledge of using the test and troubleshooting software solutions.  | 3.3.43 | 2.3 | T1 |
| BG.45 | Describes the purposes of use of telecommunication analyzers with his/her knowledge of using the test and troubleshooting software solutions.  | 3.3.43 | 2.3 | T1 |
| BG.46 | Describes the characteristics of popular network test sets (cable validator, protocol analyzer, bit error rate testing device, etc.) with his/her knowledge of using the test and troubleshooting software solutions.  | 3.3.43 | 2.3 | T1 |
| BG.47 | Lists the application platforms using his/her knowledge of system and application software products.  | 3.3.36 | 2.3 | T1 |
| BG.48 | Describes the characteristics of the data interface between the application software and the system using his/her knowledge of system and application software products. | 3.3.36 | 2.4 | T1 |
| BG.49 | Describes the function and characteristics of the content management software solutions using his/her knowledge of system and application software products. | 3.3.36 | 2.4 | T1 |
| BG.50 | Describes the function and characteristics of dynamic image generation software solutions using his/her knowledge of system and application software products.  | 3.3.36 | 2.4 | T1 |
| BG.51 | Describes the characteristics of e-trade software products using his/her knowledge of system and application software products.  | 3.3.36 | 2.4 | T1 |

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| --- | --- | --- | --- | --- |
| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.52 | Describes the characteristics of customer relationship management (CRM) software products using his/her knowledge of system and application software products.  | 3.3.36 | 2.4 | T1 |
| BG.53 | Describes the characteristics of smart card management (SCM) software products using his/her knowledge of system and application software products.  | 3.3.36 | 2.4 | T1 |
| BG.54 | Describes the characteristics of transaction analysis software products with his/her knowledge of using the test and troubleshooting software solutions.  | 3.3.43 | 2.4 | T1 |
| BG.55 | Describes the characteristics of file transfer and compression software products with his/her knowledge of using the test and troubleshooting software solutions.  | 3.3.43 | 2.4 | T1 |
| BG.56 | Describes the application performance levels and their comparisons with his/her knowledge of using the test and troubleshooting software solutions.  | 3.3.43 | 2.4 | T1 |
| BG.57 | Describes the characteristics of remote access protocols (Remote Access Service (RAS), Point to Point Protocols (PPP) etc.)) using his/her knowledge of remote management services.  | 3.3.44 | 2.4 | T1 |
| BG.58 | Describes the main characteristics of different remote connection communication types using his/her knowledge of remote management services.  | 3.3.44 | 2.5 | T1 |
| BG.59 | Describes the modems and routing devices that are used in the remote connection communication types using his/her knowledge of remote management services.  | 3.3.44 | 2.5 | T1 |
| BG.60 | Describes the characteristics of remote and distributed processing and storing (Microsoft Net. etc.) technologies using his/her knowledge of remote management services.  | 3.3.44 | 2.5 | T1 |
| BG.61 | Describes the concept and characteristics of the virtual private network (VPN) using his/her knowledge of remote management services.  | 3.3.44 | 2.5 | T1 |
| BG.62 | Describes the wide area network technologies using his/her knowledge of remote management services.  | 3.3.44 | 2.5 | T1 |
| BG.63 | Describes the Internet access technologies using his/her knowledge of remote management services  | 3.3.44 | 2.5 | T1 |
| BG.64 | Describes the main characteristics of the most common Internet access technologies using his/her knowledge of remote management services. | 3.3.44 | 2.5 | T1 |
| BG.65 | Describes the main characteristics of the most common Internet access devices using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 2.5 | T1 |
| BG.66 | Describes the characteristics of application servers using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 3.1 | T1 |
| BG.67 | Describes the characteristics of database servers using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 3.1 | T1 |
| BG.68 | Describes the characteristics of messaging and e-mail servers using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 3.1 | T1 |
| BG.69 | Describes the characteristics of proxy servers using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 3.1 | T1 |
| BG.70 | Describes the characteristics of web servers using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 3.1 | T1 |
| BG.71 | Describes the main server roles (file and print server, dhcp server, directory services server, dns server, remote access server, virtualized services, ntp server etc.) using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 3.1 | T1 |

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| --- | --- | --- | --- | --- |
| No | Description of Knowledge | NOS Related Dept. | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.72 | Describes the characteristics of mainframe servers using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 3.2 | T1 |
| BG.73 | Describes the characteristics of tower servers using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 3.2 | T1 |
| BG.74 | Describes the characteristics of rack mounted servers using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 3.2 | T1 |
| BG.75 | Describes the characteristics of blade servers using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 3.2 | T1 |
| BG.76 | Describes the characteristics of network attached storage (NAS) system using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 3.2 | T1 |
| BG.77 | Lists the components of network attached storage (NAS) device using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 3.2 | T1 |
| BG.78 | Describes the characteristics of storage area network (SAN) system using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 3.2 | T1 |
| BG.79 | Describes the characteristics of Symmetric Multiprocessing (SMP) technology using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 3.2 | T1 |
| BG.80 | Describes the characteristics of server operating systems using his/her knowledge of network server operating systems.  | 3.3.7 | 3.3 | T1 |
| BG.81 | Describes the file systems used in the server systems using his/her knowledge of network server operating systems.  | 3.3.7 | 3.3 | T1 |
| BG.82 | Describes the types and characteristics of server application types (update server and proxy server, filtering server, monitoring server, dedicated, distributed, peer to peer) using his/her knowledge of network hardware products and cable systems.  | 3.3.2 | 3.3 | T1 |
| BG.83 | Defines the network management services used in the server systems with his/her knowledge of using the test and troubleshooting software solutions.  | 3.3.43 | 3.3 | T1 |
| BG.84 | Defines the Internet services used in the server systems with his/her knowledge of using the test and troubleshooting software solutions.  | 3.3.43 | 3.3 | T1 |
| BG.85 | Describes the script languages used in the server operating systems using his/her knowledge of system and application software products.  | 3.3.36 | 3.3 | T1 |
| BG.86 | Describes the virtualization technologies and the related concepts (Resource utilization, Configuration, Interconnectivity, Management server, etc.) using his/her knowledge of system and application software products.  | 3.3.36 | 3.3 | T1 |

b) **SKILLS AND COMPETENCES**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Description of Skills and Competence  | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| - | - | - | - | - |

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13UY0165-6/A5 Creating the Infrastructure of IT

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13UY0165-6/A5 BT CREATING THE INFRASTRUCTURE OF IT QUALIFICATION UNIT

|  |  |  |
| --- | --- | --- |
| 1 | NAME OF THE QUALIFICATION UNIT | Creating the Infrastructure of IT |
| 2 | REFERENCE CODE | 13UY0165-6/A5 |
| 3 | LEVEL | 6 |
| 4 | CREDIT VALUE | - |
|  | 1. DATE OF PUBLICATION
 | 12/06/2013 |
| 5 | 1. REVISION NO
 | 00 |
|  | C) REVISION DATE | - |
| 6 | OCCUPATIONAL STANDARD FORMING THE BASIS FOR THE QUALIFICATION UNIT |
| System Manager (Level 6) National Occupation Standard 13UMS0289-6 |
| 7 | LEARNING OUTCOMES |
| **Learning Outcome 1: Describes the planning activities regarding the hardware and software products.****Performance Criteria:**1. Describes how to make the hardware and software planning of the IT infrastructure.
2. Describes how to organize the procurement and provision processes of the hardware and software.
3. Describes how to ensure the realization of periodic follow-ups of the hardware and software products in the stock of the operation.

**Learning Outcome 2: Describes the physical installation activities of the network and server systems.****Performance Criteria:**1. Describes how to organize the physical installation activities regarding the network topology.
2. Describes how to organize the physical installation activities regarding the server park and data center.

**Learning Outcome 3: Describes the installation activities of other IT hardware products.****Performance Criteria:**1. Describes how to organize the physical installation activities of personal computer systems, peripherals and other IT hardware products.
2. Describes how to ensure the configuration of peripherals to serve in common use.
3. Describes how to ensure the test of IT infrastructure.

**Learning Outcome 4: Makes the planning regarding the IT infrastructure.****Performance Criteria:**1. Makes the hardware and software planning of the IT infrastructure.
2. Performs the promotion and presentation of design plan.
 |
| 8 | ASSESSMENT |
| 8 a) Theoretical Examination |
| T1: Test examinations are used for assessment. The examination can include multiple-choice questions with a single answer, multiple-choice questions with multiple answers and true-false questions. The examination can be performed in writing as well as with a computerized medium using CBT/IBT system. If the IBT system is used; questions in the form of true-false list, matching and ordering can also be used. The participant must be directed a minimum of 15 questions with equal points and the participant must answer correctly at least 70% of the questions. The questions must be prepared in such a way to cover the learning outcomes and the "Knowledge" checklist given in ANNEX 13UY0165-6/A5-2. Average time per question must be foreseen as 1 to 1.5 minutes. |

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| **8 b) Performance Based Examination** |
| **P1 Data Center Design Practice**: The candidate is expected to specify the physical and environmental conditions, methods of access to the servers, ups (uninterruptible power supply) needs and security infrastructure of the data center, within a network topology and server system with predetermined necessities. The candidate is expect to explain and present the design that he/she will prepare according to aforementioned needs on the layout provided within the frame of the questions determined in the checklist and answer the technical questions to be addressed. The performance time is determined according to the requirements of the design. The performance of the candidate is scored according to the "Skills and Competences" checklist given in ANNEX 13UY0165-6/A5-2. The candidate must show the necessary performance in all the items listed in the checklist in order to be judged successful. |
| **8 c) Other Conditions Related to Assessment** |
| One must succeed at each of the required examinations for obtaining the Qualification Certificate within a period of one year. In case the period exceeds one year, the participant will have to retake the other exams at which he/she succeeded, as well. |
| 9 | QUALIFICATION DEVELOPMENT INSTITUTION(S) | TUBIDER IT Sector Association |
| 10 | SECTOR COMMITTEE TO VERIFY QUALIFICATION | VQA's Information Technologies Sector Committee |
| 11 | APPROVAL DATE AND NUMBER OF VQA's BOARD OF DIRECTORS | 12/06/2013 - 2013/45 |

13UY0165-6/A5 Creating the Infrastructure of IT

Date of Publication: 12/06/2013 Rev. No: 00

ANNEXES

ANNEX 13UY0165-6/A5-1: Information over Recommended Education for the Qualification Unit

For this unit, it is recommended to complete a training program that includes the following content.

**Content of Training:**

Planning the IT infrastructure Physical Installation of Network Hardware Products Physical Installation of Server Systems Physical Installation of IT Hardware Products

ANNEX 13UY0165-6/A5-2: Checklist to be used in the Assessment of the Qualification Unit

**a) KNOWLEDGE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.1 | Describes the aspects to pay attention while determining the server, network and backup system as well as the software requirements of the operation. | E.1.1 | 1.1 | T1 |
| BG.2 | Describes the aspects to pay attention while determining the physical locations, characteristics and security requirements of the server park and data centers. | E.1.2 | 1.1 | T1 |
| BG.3 | Describes how to identify the hardware or software products that are appropriate for the internal user requirements of the operation. | E.1.3 | 1.1 | T1 |
| BG.4 | Describes how to ensure the formulation of a network plan that corresponds to the requirements specified by the authorized network technologies specialist. | E.1.4 | 1.1 | T1 |
| BG.5 | Describes the points to pay attention while drawing up the configuration plan for network hardware products and server systems. | E.1.5 | 1.1 | T1 |
| BG.6 | Describes how to control the compatibility of technical characteristics of preferred IT hardware and software products with the requirements and existing hardware and software and other procured products in the operation. | E.1.6E.1.7 | 1.1 | T1 |
| BG.7 | Describes the aspects to pay attention while performing the tasks given to him/her within the approval mechanism in the procurement process, in accordance with the operation rules and methods. | E.1.8 | 1.1 | T1 |
| BG.8 | Describes the points to pay attention while preparing the disaster plan in accordance with the IT infrastructure planned. | E.1.9 | 1.1 | T1 |
| BG.9 | Describes how to perform the necessary inspections (necessary allocation for the reception of procured hardware, reception and acceptance of the software installation packages and, if available, license documents and product keys according to the related procurement type) in order for the procurement and provision processes to be completed according to the rules and methods of the operation and at the set time. | E.2.1E.2.2E.2.3 | 1.2 | T1 |

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| --- | --- | --- | --- | --- |
| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.10 | Describes how to check whether the documents (user guides, invoice copies and guarantee documents), stock and fixture records of the IT hardware products are kept in a proper state.  | E.2.4E.2.5 | 1.2 | T1 |
| BG.11 | Describes how to ensure the follow up of the technological lives and guarantee periods of the IT hardware as well as the scope and duration of software licenses and license agreements in the hardware park of the operation.  | E.3.1E.3.2 | 1.3 | T1 |
| BG.12 | Describes the points to pay attention while informing the managers and procurement officials in charge in time about the hardware and software products to be renewed.  | E.3.3 | 1.3 | T1 |
| BG.13 | Describes how to implement the operation rules and methods specified for the hardware products that are or about to be out of guarantee.  | E.3.4 | 1.3 | T1 |
| BG.14 | Describes the points to pay attention while formulating the work organization by designating the work commands and plans according to the approved network design.  | E.4.1 | 2.1 | T1 |
| BG.15 | Describes the request and reception procedures of the materials (request of the materials from the warehouse by filling out a request form, acceptance of the materials after checking whether they have been exposed to physical impact and whether they are free of damage, controlling the guarantee documents of the products) specified in the network design.  | E.4.2E.4.3E.4.5 | 2.1 | T1 |
| BG.16 | Describes how to ensure the reception of the assembly guidance and other technical documents (assembly picture, list of components, and circuit diagrams) of the network hardware products to be set up.  | E.4.4 | 2.1 | T1 |
| BG.17 | Describes how to ensure keeping the necessary consumables such as cable tie, screw, etc. to be used during the assembly at the work place along with their spares.  | E.4.6 | 2.1 | T1 |
| BG.18 | Describes how to ensure the preparation of assembly materials and locations such as shelves and cupboards for network hardware products.  | E.5.1 | 2.2 | T1 |
| BG.19 | Describes how to control that the power and grounding are functioning properly and that they meet the electrical security needs by checking the measurement reports.  | E.5.2 | 2.2 | T1 |
| BG.20 | Describes the aspects to pay attention while observing the environmental condition regulators such as moisture and cooling and fire prevention needs and notifying the faults identified to the related authorized professional or administrative authorities.  | E.5.3 | 2.2 | T1 |
| BG.21 | Describes how to ensure the realization of assembly procedures of the network hardware according to the layout.  | E.5.4 | 2.2 | T1 |
| BG.22 | Describes the preparations to be made for the installation (preparation of the IT hardware and other terminals for the installation, backup of the data at the old server and backup systems hardware products, controlling the assembly materials and locations such as shelves and cupboards) according to the server, network and backup designs that he/she has prepared.  | E.6.1E.6.2E.6.3 | 3.1 | T1 |

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| --- | --- | --- | --- | --- |
| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.23 | Describes how to control that the power and grounding are functioning properly and that they meet the electrical security needs by checking the measurement reports prepared by the electrician.  | E.6.4 | 3.1 | T1 |
| BG.24 | Describes the to follow while observing the environmental condition regulators such as moisture and cooling and fire prevention needs and notifying the faults identified to the air conditioning systems professional or administrative authorities.  | E.6.5 | 3.1 | T1 |
| BG.25 | Describes how to control the assembly procedures of the network hardware products (server and backup computer systems) according to the layout.  | E.6.6E.6.7 | 3.1 | T1 |
| BG.26 | Describes how to ensure the positioning of the IT systems that will be in common use (printer, etc.) to the shared use areas in accordance with their technical characteristics.  | E.6.8 | 3.1 | T1 |
| BG.27 | Describes how to ensure the control of the warning signs and signboards regarding the use of the devices in accordance with the operation rules and methods.  | E.6.9 | 3.1 | T1 |
| BG.28 | Describes how to ensure the configuration of the wired or wireless network interfaces of the hardware products with a network connection support.  | E.7.1 | 3.2 | T1 |
| BG.29 | Describes how to ensure the sharing settings configuration of the hardware products, which do not have a network connection support but will be used via the network, over the computer systems to which they are connected.  | E.7.2 | 3.2 | T1 |
| BG.30 | Describes how to control the realization of the necessary configurations in the hardware products using consumables, in such a way that will enable the efficiency of the operation resources.  | E.7.3 | 3.2 | T1 |
| BG.31 | Describes how to ensure the realization of the necessary access configurations at the computers that will use the peripherals in common use.  | E.7.4 | 3.2 | T1 |
| BG.32 | Describes how to ensure the physical test of the network installation.  | E.8.1 | 3.3 | T1 |
| BG.33 | Describes how to ensure verifying that the system is functioning without any problem using the identification software and recording the identification reports in accordance with the standards determined by the operation.  | E.8.2 | 3.3 | T1 |
| BG.34 | Describes how to ensure the verification of the functions of peripheral devices and their operation on the operating system without any problem.  | E.8.3 | 3.3 | T1 |
| BG.35 | Describes how to control the operation of server, network and backup systems following the physical installation.  | E.8.4 | 3.3 | T1 |
| BG.36 | Describes how to enable the control of the shared hardware accesses connected to the systems and the trial of the new components in a previously controlled medium.  | E.8.5E.8.6 | 3.3 | T1 |
| BG.37 | Describes the points to pay attention in the report to be prepared by evaluating the test results.  | E.8.7 | 3.3 | T1 |

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**b) SKILLS AND COMPETENCES**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Description of Skills and Competence | NOS Related Dept | Qualification Unit Performance Criterion | Evaluation Mean |
| BY.1 | Determines the server, network and backup system as well as the software requirements of the operation.  | E.1.1 | 4.1 | P1 |
| BY.2 | Determines the physical locations, environmental conditions (power, UPS requirements, cooling systems, etc.), characteristics and security requirements (physical security, access security, log files, passwords, user access authorizations, etc.) of the server park and data centers.  | E.1.2 | 4.1 | P1 |
| BY.3 | Identifies the hardware or software products that are appropriate for the internal user requirements of the operation.  | E.1.3 | 4.1 | P1 |
| BY.4 | Gives the design presentation with presentation software using his/her knowledge of system and application software products.  | 3.3.36 | 4.2 | P1 |

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13UY0165-/A6 Configuration of the Network and Server Systems

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13UY0165-6/A6 CONFIGURATION OF THE NETWORK AND SERVER SYSTEMS QUALIFICATION UNIT

|  |  |  |
| --- | --- | --- |
| 1 | NAME OF THE QUALIFICATION UNIT | Configuration of the Network and Server Systems |
| 2 | REFERENCE CODE | 13UY0165-6/A6 |
| 3 | LEVEL | 6 |
| 4 | CREDIT VALUE | - |
|  | A)DATE OF PUBLICATION | 12/06/2013 |
| 5 | B)REVISION NO | 00 |
|  | C) REVISION DATE | - |
| 6 | OCCUPATIONAL STANDARD FORMING THE BASIS FOR THE QUALIFICATION UNIT |
| System Manager (Level 6) National Occupation Standard 13UMS0289-6 |
| 7 | LEARNING OUTCOMES |
| **Learning Outcome 1:** **Describes how to configure the network hardware products.****Performance Criteria:**1. Describes how to configure the active network hardware products.
2. Describes how to realize the local network, wide area network and internet connection.
3. Describes how to ensure the wireless network security.
4. Describes how to perform the routing process.
5. Describes the aspects to pay attention while formulating the IP address distribution plan.
6. Describes how to enable the configuration of personal computer systems and their peripheral devices.

**Learning Outcome 2:** **Describes how to configure the server systems.****Performance Criteria:**1. Describes how to enable the installations of server operating systems.
2. Describes how to configure the server services.
3. Describes how to configure the index service.
4. Describes how to configure the electronic mail service.
5. Describes how to configure the other network services that will operate on the servers.

**Learning Outcome 3:** **Configures the server systems.****Performance Criteria:**1. Performs the installation of server operating systems.
2. Configures the server systems.
 |
| 8 | ASSESSMENT |
| **8 a) Theoretical Examination** |
| T1: Test examinations are used for assessment. The examination can include multiple-choice questions with a single answer, multiple-choice questions with multiple answers and true-false questions. The examination can be performed in writing as well as with a computerized medium using CBT/IBT system. If the IBT system is used; questions in the form of true-false list, matching and ordering can also be used. The participant must be directed a minimum of 30 questions with equal points and the participant must answer correctly at least 70% of the questions. The questions must be prepared in such a way to cover the learning outcomes and the “Knowledge” checklist given in ANNEX 13UY0165-6/A6-2. Average time per question must be foreseen as 1 to 1.5 minutes. |

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13UY0165-/A6 Configuration of the Network and Server Systems

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| **8 b) Performance Based Examination** |
| **P1 Installation and Configuration Practice for the Server Operating System**: The candidate is expected to start the installation of the operating system that he/she will choose among the server operating system alternatives given and to realize the configuration procedures (configuration of user management and at least two different server roles) requested over another server that has been previously installed via the operating system he/she has chosen. The performance time is determined according to the complication level of the operating system and the server roles. The performance of the candidate is scored according to the "Skills and Competences" checklist given in ANNEX 13UY0165-6/A6-2. The candidate must show the necessary performance in all the items listed in the checklist in order to be judged successful. |
| **8 c) Other Conditions Related to Assessment** |
| One must succeed at each of the required examinations for obtaining the Qualification Certificate within a period of one year. In case the period exceeds one year, the participant will have to retake the other exams at which he/she succeeded, as well |
| 9 | QUALIFICATION DEVELOPMENT INSTITUTION(S) | TUBIDER IT Sector Association |
| 10 | SECTOR COMMITTEE TO VERIFY QUALIFICATION | VQA's Information Technologies Sector Committee |
| 11 | APPROVAL DATE AND NUMBER OF VQA's BOARD OF DIRECTORS | 12/06/2013 - 2013/45 |

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13UY0165-/A6 Configuration of the Network and Server Systems

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**ANNEXES**

ANNEX 13UY0165-6/A6-1: Information over Recommended Education for the Qualification Unit

For this unit, it is recommended to complete a training program that includes the following content.

**Content of Training:**

Establishment of Network Connection Wireless Network Security Routing

Personal Computer Configuration Computer Peripheral Device Configuration Server Operating System Installation Server Service Configuration Network Service Configuration

ANNEX 13UY0165-6/A6-2: Checklist to be used in the Assessment of the Qualification Unit

**a) KNOWLEDGE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.1 | Describes the points to pay attention while enabling the creation of network backbone with the interconnection of active network hardware products via network cables.  | F.1.1 | 1.1 | T1 |
| BG.2 | Describes the software configuration of active network hardware products in accordance with the network configuration plan.  | F.1.2 | 1.1 | T1 |
| BG.3 | Describes the aspects to pay attention while determining the renewal of the access passwords for the network hardware products.  | F.1.3 | 1.1 | T1 |
| BG.4 | Describes the tasks regarding the backup of the network configuration data in such a way to keep them also in resources out of the network.  | F.1.4 | 1.1 | T1 |
| BG.5 | Describes how to ensure the establishment of local network structure with the realization of the assembly and cable connections of the peripheral devices that will be in common use, in accordance with the network design plan.  | F.2.1 | 1.2 | T1 |
| BG.6 | Describes how to ensure the configuration of the peripheral devices that will be in common use on the local network and their test on the end users.  | F.2.2 | 1.2 | T1 |
| BG.7 | Describes how to ensure the realization of the assembly and cable connections of the wide area network and Internet access hardware products.  | F.2.3 | 1.2 | T1 |
| BG.8 | Describes how to ensure the test of Internet connection configuration with an access to a web site.  | F.2.4 | 1.2 | T1 |
| BG.9 | Describes how to make the wide area network configuration.  | F.2.5 | 1.2 | T1 |
| BG.10 | Describes how to ensure the configuration of wireless access point names, authorization and encryption methods in a way that will enable the security.  | F.3.1 | 1.3 | T1 |

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13UY0165-/A6 Configuration of the Network and Server Systems

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| --- | --- | --- | --- | --- |
| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.11 | Describes the tasks to be carried out regarding the wireless access passwords (determination of the renewal periods of access passwords, ensuring their distribution to the authorized personnel) in accordance with the security policy.  | F.3.2F.3.3 | 1.3 | T1 |
| BG.12 | Describes how to configure the default routes. | F.4.1 | 1.4 | T1 |
| BG.13 | Describes how to realize the static routing configuration.  | F.4.2 | 1.4 | T1 |
| BG.14 | Describes the realization of dynamic routing using the proper routing protocols.  | F.4.3 | 1.4 | T1 |
| BG.15 | Describes the points to pay attention while identifying the end network hardware products to which dynamic and fixed IP addresses will be allocated.  | F.5.1 | 1.5 | T1 |
| BG.16 | Describes how to calculate the sub-networks according to the IP version specified in the topology and the IP address number to be needed.  | F.5.2 | 1.5 | T1 |
| BG.17 | Describes the configuration of central IP distribution service for the end network hardware products to be allocated dynamic IP addresses.  | F.5.3 | 1.5 | T1 |
| BG.18 | Describes how to ensure the realization of the update and installation of software patches for the installed operating system using the existing updating tool within the system or via the website of the operating system producer.  | F.6.1 | 1.6 | T1 |
| BG.19 | Describes how to ensure the realization of the installation of up-to-date security software that will be used in the end network hardware products and the update of the identification data.  | F.6.2 | 1.6 | T1 |
| BG.20 | Describes how to ensure the installation of possible software updates and extensions to the operating system in order to further improve the system performance.  | F.6.3 | 1.6 | T1 |
| BG.21 | Describes how to ensure the configuration and installation of security software solutions that will meet the user needs for ensuring the main operating system security.  | F.6.4 | 1.6 | T1 |
| BG.22 | Describes how to ensure the collection and backup of the disk image of the operating system at the end of the installation process for an easy reinstallation in case of a potential problem in the future.  | F.6.5 | 1.6 | T1 |
| BG.23 | Describes how to ensure the realization of configuration procedures regarding the index topology if the personal computers are envisaged to operate as connected to an index service.  | F.6.6 | 1.6 | T1 |
| BG.24 | Describes how to ensure the preparation of the installation software products of the open-source coded and/or other operating systems that are identified according to the operation rules and methods as well as the user needs.  | G.1.1 | 2.1 | T1 |
| BG.25 | Describes how to identify the virtualization requirements and opportunities.  | G.1.2 | 2.1 | T1 |
| BG.26 | Describes how to ensure the realization of the installation of the operating system supporter platform if the operating system is to be installed within a virtual system supporter.  | G.1.3 | 2.1 | T1 |

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13UY0165-/A6 Configuration of the Network and Server Systems

Date of Publication: 12/06/2013 Rev. No: 00

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.27 | Describes how to ensure the installation of network server operating system.  | G.1.4 | 2.1 | T1 |
| BG.28 | Describes how to ensure the check of the up-to-date versions of the hardware servers and their installations.  | G.1.5 | 2.1 | T1 |
| BG.29 | Describes how to ensure the installation of communication protocols and the configuration of network access settings.  | G.1.6 | 2.1 | T1 |
| BG.30 | Describes how to ensure checking whether they need to be updated and the installation of updates.  | G.1.7 | 2.1 | T1 |
| BG.31 | Describes how to ensure the installation of network management services.  | G.2.1 | 2.2 | T1 |
| BG.32 | Describes the configuration of IP address distribution service according to the company policy, topology and network configuration plan.  | G.2.2 | 2.2 | T1 |
| BG.33 | Describes the configuration of network name analysis service by also defining the local area names.  | G.2.3 | 2.2 | T1 |
| BG.34 | Describes how to make identification in order to deactivate the unnecessary server services. | G.2.4 | 2.2 | T1 |
| BG.35 | Describes the configuration of local firewall software and its security settings.  | G.2.5 | 2.2 | T1 |
| BG.36 | Describes the configuration of the remote access to the server.  | G.2.6 | 2.2 | T1 |
| BG.37 | Describes the configuration of network management services related to the index service in accordance with the index topology.  | G.3.1 | 2.3 | T1 |
| BG.38 | Describes the configuration of the network interface where the index service will be valid.  | G.3.2 | 2.3 | T1 |
| BG.39 | Describes the configuration of Internet and intranet index service.  | G.3.3 | 2.3 | T1 |
| BG.40 | Describes the aspects to pay attention while designating the user groups, users and computer accounts.  | G.3.4 | 2.3 | T1 |
| BG.41 | Describes how to manage the user medium with the rules for the user groups.  | G.3.5 | 2.3 | T1 |
| BG.42 | Describes how to ensure the security of user accounts with the management of password creation rules.  | G.3.6 | 2.3 | T1 |
| BG.43 | Configures the electronic mail server and to describe how to create the institutional messaging infrastructure.  | G.4.1 | 2.4 | T1 |
| BG.44 | Describes how to ensure the management and control of mail box database.  | G.4.2 | 2.4 | T1 |
| BG.45 | Describes the points to pay attention while distributing the addresses and passwords to all electronic mail users.  | G.4.3 | 2.4 | T1 |
| BG.46 | Describes how to realize the interworking and clustering procedures for more than one electronic mail servers.  | G.4.4 | 2.4 | T1 |
| BG.47 | Describes how to ensure an effective mail security.  | G.4.5 | 2.4 | T1 |

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13UY0165-/A6 Configuration of the Network and Server Systems

Date of Publication: 12/06/2013 Rev. No:00

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| --- | --- | --- | --- | --- |
| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.48 | Describes how to ensure the security against potential threats (viruses, trojans, worms, spyware, fraud initiatives, data loss, etc.) and unnecessary content (adware, spam, inappropriate content, etc.) that appear through mails.  | G.4.6 | 2.4 | T1 |
| BG.49 | Determines the common file sharing areas and to describe the file sharing service.  | G.5.1 | 2.5 | T1 |
| BG.50 | Designates the printers that will be in common use and to describe the configuration of printing service.  | G.5.2 | 2.5 | T1 |
| BG.51 | Describes the configuration of fax sending and receiving service. | G.5.3 | 2.5 | T1 |
| BG.52 | Describes how the users or user groups will realize the source access configuration.  | G.5.4 | 2.5 | T1 |
| BG.53 | Describes the points to pay attention while sharing the access information with the professionals who have a server management authority.  | G.5.5 | 2.5 | T1 |
| BG.54 | Describes the configuration of IP address distribution service according to the operation policy, and topology.  | G.5.6 | 2.5 | T1 |
| BG.55 | Describes the configuration of proxy server service.  | G.5.7 | 2.5 | T1 |

**b) SKILLS AND COMPETENCES**

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Skill and Competence Description | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BY.1 | Installs the network server operating system. | G.1.4 | 3.1 | P1 |
| BY.2 | Configures the IP address distribution service according to the company policy, topology and network configuration plan.  | G.2.2 | 3.2 | P1 |
| BY.3 | Configures the network name analysis service by also defining the local area names.  | G.2.3 | 3.2 | P1 |
| BY.4 | Configures the local firewall software and its security settings.  | G.2.5 | 3.2 | P1 |
| BY.5 | Configures the remote access to the server. | G.2.6 | 3.2 | P1 |

13UY0165-6/A7 Operation of the Systems and Applications

Date of Publication: 12/06/2013 Rev. No: 00

13UY0165-6/A7 OPERATION OF THE SYSTEMS AND APPLICATIONS QUALIFICATION UNIT

|  |  |  |
| --- | --- | --- |
| 1 | NAME OF THE QUALIFICATION UNIT | Operation of the Systems and Applications |
| 2 | REFERENCE CODE | 13UY0165-6/A7 |
| 3 | LEVEL | 6 |
| 4 | CREDIT VALUE | - |
|  | A)DATE OF PUBLICATION | 12/06/2013 |
| 5 | B)REVISION NO | 00 |
|  | C) REVISION DATE | - |
| 6 | OCCUPATIONAL STANDARD FORMING THE BASIS FOR THE QUALIFICATION UNIT |
| System Manager (Level 6) National Occupation Standard 13UMS0289-6 |
| 7 | LEARNING OUTCOMES |
| **Learning Outcome 1: Describes how to operate the server, network and backup systems.****Performance Criteria:**1. Describes how to monitor the server, network and backup systems.
2. Describes how to check errors in the server, network and backup systems.
3. Describes how to manage the server, network and backup systems.
4. Describes the aspects to pay attention while uploading software to the server, network and backup systems.
5. Describes how to control the backup procedures.
6. Describes the points to pay attention while formulating the server and network security plan and how to follow up the implementation of the plan.

**Learning Outcome 2: Describes how to operate the Internet and intranet applications.****Performance Criteria:**1. Describes how to manage the web sites and Internet applications.
2. Describes how to monitor the applications.
3. Describes how to ensure the test and quality assurance for the web sites and web applications.

**Learning Outcome 3: Operates the server, network and backup systems.****Performance Criteria:*** 1. Monitors the server, network and backup systems.
	2. Checks errors in the server, network and backup systems.
	3. Manages the server, network and backup systems.
 |
| 8 | ASSESSMENT |
| **8 a) Theoretical Examination** |
| T1: Test examinations are used for assessment. The examination can include multiple-choice questions with a single answer, multiple-choice questions with multiple answers and true-false questions. The examination can be performed in writing as well as with a computerized medium using CBT/IBT system. If the IBT system is used; questions in the form of true-false list, matching and ordering can also be used. The participant must be directed a minimum of 30 questions with equal points and the participant must answer correctly at least 70% of the questions. The questions must be prepared in such a way to cover the learning outcomes and the “Knowledge” checklist given in ANNEX 13UY0165-6/A7-2. Average time per question must be foreseen as 1 to 1.5 minutes |
| **8 b) Performance Based Examination** |
| P1 System Operation Practice: The candidate is expected to manage (monitoring and error check) the server system on a network and server system with provided information in accordance with the procedures and rules by using an operating system of his/her own choice among the server operating system alternatives provided and to answer the technical questions to be addressed within the frame of the questions specified in the checklist. The performance time is determined according to the complication of management tasks. The performance of the candidate is scored according to the "Skills and Competences" checklist given in ANNEX 13UY0165-6/A7-2. The candidate must show the necessary performance in all the items listed in the checklist in order to be judged successful. |

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| - |
| 8 c) Other Conditions Related to Assessment |
| One must succeed at each of the required examinations for obtaining the Qualification Certificate within a period of one year. In case the period exceeds one year, the participant will have to retake the other exams at which he/she succeeded, as well.  |
| 9 | QUALIFICATION DEVELOPMENT INSTITUTION(S)  | TUBIDER IT Sector Association |
| 10 | SECTOR COMMITTEE TO VERIFY QUALIFICATION | VQA's Information Technologies Sector Committee |
| 11 | APPROVAL DATE AND NUMBER OF VQA's BOARD OF DIRECTORS  | 12/06/2013 - 2013/45 |

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**ANNEXES**

ANNEX 13UY0165-6/A7-1: Information over Recommended Education for the Qualification Unit

For this unit, it is recommended to complete a training program that includes the following content.

**Content of Training:**

Monitoring Techniques for Server and Network Systems

Error Check Methods for Server and Network Systems

Server and Network Systems Management

Backup Techniques

Network Security Plan Formulation Techniques

Management and Monitoring Techniques for Web Site and Internet Applications Quality Assurance Principles for Web Site and Internet Applications

ANNEX 13UY0165-6/A7-2: Checklist to be used in the Assessment of the Qualification Unit

**a) KNOWLEDGE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.1 | Describes how to monitor the alerts and events.  | H.1.1H.1.2 | 1.1 | T1 |
| BG.2 | Describes the aspects to pay attention while following up the information that appears in the monitoring system.  | H.1.3 | 1.1 | T1 |
| BG.3 | Describes how to monitor the past task records, performance and resource use of system performances.  | H.1.4 | 1.1 | T1 |
| BG.4 | Describes how to check the compatibility of the alerts, events, and messages that appear in the monitoring system with the operation processes.  | H.1.5 | 1.1 | T1 |
| BG.5 | Describes the points to pay attention while examining the effects of power and environmental conditions on the system hardware.  | H.1.6 | 1.1 | T1 |
| BG.6 | Describes the points to pay attention while reporting the system performance monitored for comparison with the managers and subsequent levels.  | H.2.1 | 1.2 | T1 |
| BG.7 | Describes the aspects to pay attention while recording the problems encountered during the operation in accordance with the problem management processes.  | H.2.2 | 1.2 | T1 |
| BG.8 | Describes how to perform the first-level analysis of the problems that appear during the operation in accordance with the problem management processes.  | H.2.3 | 1.2 | T1 |
| BG.9 | Describes the way to follow for notifying the problems encountered during the operation to the authorized units in accordance with the problem management processes.  | H.2.4 | 1.2 | T1 |
| BG.10 | Describes how to check the compatibility of the bandwidth taken from the service providers for Internet connection with the service level agreement.  | H.2.5 | 1.2 | T1 |

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13UY0165-6/A7 Operation of the Systems and Applications

Date of Publication: 12/06/2013 Rev. No:00

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| --- | --- | --- | --- | --- |
| No | Description of Knowledge | NOS Related Dept | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.11 | Describes how to test whether the system is functioning without any problem using the identification software products, according to the standards specified by the operation.  | H.2.6 | 1.2 | T1 |
| BG.12 | Describes how to realize the necessary system and medium operation in accordance with the instruction specified in the computer, network and backup systems.  | H.3.1H.3.2 | 1.3 | T1 |
| BG.13 | Describes how to ensure the up-to-date performance of the systems by following the previous updates.  | H.3.3 | 1.3 | T1 |
| BG.14 | Describes how to operate the backup systems in accordance with the instructions and processes.  | H.3.4 | 1.3 | T1 |
| BG.15 | Describes how to operate the printer media in accordance with the instructions and processes.  | H.3.5 | 1.3 | T1 |
| BG.16 | Lists the procedures to be carried out as corrective measures by following up the service cuts, security violations, the attacks to the network services.  | H.3.6 | 1.3 | T1 |
| BG.17 | Describes how to realize the updating procedures defined by instructions by following up new updates for the system software products.  | H.3.7 | 1.3 | T1 |
| BG.18 | Describes the points to pay attention during the reflection of the changes in the backup system on the disaster plan.  | H.3.8 | 1.3 | T1 |
| BG.19 | Describes how to realize the software installation and settings according to the processes and instructions.  | H.4.1H.4.2 | 1.4 | T1 |
| BG.20 | Describes how to monitor the events via the console in accordance with the instructions.  | H.4.3 | 1.4 | T1 |
| BG.21 | Describes how to conduct the problem management via the console in accordance with the instructions.  | H.4.4th | 1.4 | T1 |
| BG.22 | Describes how to conduct the change management via the console in accordance with the instructions.  | H.4.5 | 1.4 | T1 |
| BG.23 | Describes the points to pay attention while giving the necessary operation support via the console in accordance with the instructions.  | H.4.6 | 1.4 | T1 |
| BG.24 | Describes how to monitor the Batch procedures in accordance with the instructions and processes.  | H.4.7 | 1.4 | T1 |
| BG.25 | Describes how to conduct the event management regarding the Batch tasks in accordance with the instructions.  | H.4.8 | 1.4 | T1 |
| BG.26 | Describes how to conduct the change management regarding the Batch tasks in accordance with the instructions.  | H.4.9 | 1.4 | T1 |
| BG.27 | Describes how to ensure the activation of automatic backup and backup check cycles determined and the follow-up of their operation.  | H.5.1H.5.2 | 1.5 | T1 |
| BG.28 | Describes the backup task before critical system tasks (except for the backups taken as standard) provided that they are indicated in the instructions.  | H.5.3 | 1.5 | T1 |
| BG.29 | Describes how to check whether the backup cycles function efficiently. | H.5.4 | 1.5 | T1 |
| BG.30 | Describes how to ensure the formulation of a server and network security plan that are suitable for the network topology, along with the authorized security personnel.  | H.6.1 | 1.6 | T1 |
| BG.31 | Describes monitoring the systems according to the server and network security plan.  | H.6.2 | 1.6 | T1 |

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| --- | --- | --- | --- | --- |
| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.32 | Describes following up the user security according to the server and network security plan.  | H.6.3 | 1.6 | T1 |
| BG.33 | Describes how to develop the security according to the user experiences and industrial developments.  | H.6.4 | 1.6 | T1 |
| BG.34 | Describes the points to pay attention while reporting the monitoring results of the server and network security.  | H.6.5 | 1.6 | T1 |
| BG.35 | Describes the management of Internet and intranet servers.  | I.1.1 | 2.1 | T1 |
| BG.36 | Describes how to ensure the security of Internet and intranet servers in accordance with the network security plan.  | I.1.2 | 2.1 | T1 |
| BG.37 | Describes how to inspect the legal conformity of the web site content and applications used.  | I.1.3 | 2.1 | T1 |
| BG.38 | Describes the aspects to pay attention while documenting the application and site changes.  | I.1.4 | 2.1 | T1 |
| BG.39 | Describes how to apply new technological changes in the Internet and intranet media.  | I.1.5 | 2.1 | T1 |
| BG.40 | Describes the aspects to pay attention while integrating the customer views into the interfaces.  | I.1.6 | 2.1 | T1 |
| BG.41 | Describes how to monitor the web site performance measurements.  | I.1.7 | 2.1 | T1 |
| BG.42 | Lists the potential maintenance activities for the applications.  | I.1.8 | 2.1 | T1 |
| BG.43 | Describes the aspects to pay attention during the maintenance of the applications.  | I.1.8 | 2.1 | T1 |
| BG.44 | Describes the aspects to pay attention while uploading the updates for improvement and optimization purposes.  | I.1.9 | 2.1 | T1 |
| BG.45 | Describes how to monitor the alerts and events that appear in the applications.  | 1.2.11.2.2 | 2.2 | T1 |
| BG.46 | Describes how to monitor the information that appears in the applications.  | I.2.3 | 2.2 | T1 |
| BG.47 | Describes the points to pay attention while developing availability and test integration.  | I.3.1 | 2.3 | T1 |
| BG.48 | Describes how to develop test procedures and performance evaluation requirements.  | I.3.2 | 2.3 | T1 |
| BG.49 | Describes how to ensure the quality assurance in customer service.  | I.3.3 | 2.3 | T1 |
| BG.50 | Describes how to apply the performance increase and optimization developments.  | I.3.4 | 2.3 | T1 |
| BG.51 | Describes how to monitor the work load in the network and servers.  | I.3.5 | 2.3 | T1 |
| BG.52 | Describes how to operate the event management processes.  | I.3.6 | 2.3 | T1 |
| BG.53 | Describes how to operate the change management processes.  | I.3.7 | 2.3 | T1 |
| BG.54 | Describes how to manage the timing and priorities of the processes.  | I.3.8 | 2.3 | T1 |
| BG.55 | Describes the points to pay attention while documenting the test results and corrective measures.  | I.3.9 | 2.3 | T1 |

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13UY0165-6/A7 Operation of the Systems and Applications

Date of Publication: 12/06/2013 Rev. No: 00

**b) SKILLS AND COMPETENCES**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Skill and Competence Description | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BY.1 | Monitors the alerts and events.  | H.1.1H.1.2 | 3.1 | P1 |
| BY.2 | Describes how to ensure monitoring the past task records, performance and resource use of system performances.  | H.1.4 | 3.1 | P1 |
| BY.3 | Performs the first-level analysis of the problems that appear during the operation in accordance with the problem management processes.  | H.2.3 | 3.2 | P1 |
| BY.4 | Checks the compatibility of the bandwidth taken from the service providers for Internet connection with the service level agreement.  | H.2.5 | 3.2 | P1 |
| BY.5 | Tests whether the system is functioning without any problem using the identification software products, according to the standards specified by the operation.  | H.2.6 | 3.2 | P1 |
| BY.6 | Realizes the necessary system and medium operation in accordance with the instruction specified in the computer, network and backup systems.  | H.3.1H.3.2 | 3.3 | P1 |

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13UY0165-6/A8 Maintenance and Troubleshooting in the Network and Server Systems

Date of Publication: 12/06/2013 Rev. No: 00

13UY0165-6/A8 MAINTENANCE AND TROUBLESHOOTING IN THE NETWORK AND SERVER SYSTEMS QUALIFICATION UNIT

|  |  |  |
| --- | --- | --- |
| 1 | NAME OF THE QUALIFICATION UNIT | Maintenance and Troubleshooting in the Network and Server Systems |
| 2 | REFERENCE CODE | 13UY0165-6/A8 |
| 3 | LEVEL | 6 |
| 4 | CREDIT VALUE | - |
| 5 | A)DATE OF PUBLICATION | 12/06/2013 |
| B)REVISION NO | 00 |
| C) REVISION DATE | - |
| 6 | OCCUPATIONAL STANDARD FORMING THE BASIS FOR THE QUALIFICATION UNIT |
| System Manager (Level 6) National Occupation Standard 13UMS0289-6 |
| 7 | LEARNING OUTCOMES |
| **Learning Outcome 1: Describes how to maintain the server, network and backup systems. Performance Criteria:**1. Describes how to install the backup system.
2. Describes how to plan the protective and periodic maintenance activities.
3. Describes how to ensure the realization of periodic network security follow-ups.
4. Describes how to ensure the maintenance of operating system and server software products.
5. Describes how to ensure the data security and confidentiality.

**Learning Outcome 2: Performs the maintenance of server and network systems.****Performance Criteria:**1. Establishes the backup system.
2. Performs the periodic network security follow-ups.

**Learning Outcome 3: Describes how to resolve the problems in the server and network systems. Performance Criteria:**1. Describes how to collect information about the problems of IT systems.
2. Describes how to ensure the resolution of simple connection problems and physical faults.
3. Describes how to resolve the problems in the network topology.
4. Describes how to resolve the software problems in the server, network and backup systems.

**Learning Outcome 3: Resolves the problems in the server and network systems.****Performance Criteria:*** 1. Resolves simple connection problems and physical faults.
	2. Resolves the software problems in the server, network and backup systems.
 |
| 8 | ASSESSMENT |
| 8 a) Theoretical Examination |
| T1: Multiple choice examinations are used for assessment. The examination can include multiple-choice questions with a single answer, multiple-choice questions with multiple answers and true-false questions. The examination can be performed in writing as well as with a computerized medium using CBT/IBT system. If the IBT system is used; questions in the form of true-false list, matching and ordering can also be used. The participant must be directed a minimum of 30 questions with equal points and the participant must answer correctly at least 70% of the questions. The questions must be prepared in such a way to cover the learning outcomes and the “Knowledge” checklist given in ANNEX 13UY0165-6/A8-2. Average time per question must be foreseen as 1 to 1.5 minutes. |

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13UY0165-6/A8 Maintenance and Troubleshooting in the Network and Server Systems

Date of Publication: 12/06/2013 Rev. No: 00

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| --- |
| 8 b) Performance Based Examination |
| **P1 Practice for the Realization of Backup/Recovery Activities**: The candidate is expected to realize the backup and data recovery in the operating system of his/her choice among the server operating system alternatives provided, within the frame of the procedures and rules in the disaster scenario created (except the backups taken as standard). The performance time is determined according to the type and scope of the backup. The performance of the candidate is scored according to the "Skills and Competences" checklist given in ANNEX 13UY0165-6/A8-2. The candidate must show the necessary performance in all the items listed in the checklist in order to be judged successful.P2 Error Identification and Troubleshooting Practice in the Server Systems: The candidate is expected to realize the hardware and software checks for identifying potential problems in the operating system of his/her choice among the server operating system alternatives provided and to remove the troubles within his/her authority (simple hardware faults, RAID configuration errors, errors related to the simple server role and services). The performance time is determined according to the complication level of requested problems. The performance of the candidate is scored according to the "Skills and Competences" checklist given in ANNEX 13UY0165-6/A8-2. The candidate must show the necessary performance in all the items listed in the checklist in order to be judged successful. P3 Error Identification and Troubleshooting Practice in the Network Systems: The candidate is expected to realize the hardware and software checks for identifying potential problems in the network systems to which the operating system of his/her choice among the server operating system alternatives provided is connected and to remove the troubles within his/her authority (software problems in the network device, configuration errors). The performance time is determined according to the complication level of the problems to be resolved. The performance of the candidate is scored according to the "Skills and Competences" checklist given in ANNEX 13UY0165-6/A8-2. The candidate must show the necessary performance in all the items listed in the checklist in order to be judged successful.P4 Error Identification and Troubleshooting Practice in the Backup Systems: The candidate is expected to realize the hardware and software checks for identifying potential problems in the backup systems of the operating system of his/her choice among the server operating system alternatives provided and to remove the troubles within his/her authority (overflow capacity in the backup systems, access problems and technical faults). The performance time is determined according to the complication level of requested problems. The performance of the candidate is scored according to the "Skills and Competences" checklist given in ANNEX 13UY0165-6/A8-2. The candidate must show the necessary performance in all the items listed in the checklist in order to be judged successful. |
| **8 c) Other Conditions Related to Assessment** |
| One must succeed at each of the required examinations for obtaining the Qualification Certificate within a period of one year. In case the period exceeds one year, the participant will have to retake the other exams at which he/she succeeded, as well. |
| 9 | QUALIFICATION DEVELOPMENT INSTITUTION(S) | TUBIDER IT Sector Association |
| 10 | SECTOR COMMITTEE TO VERIFY QUALIFICATION | VQA's Information Technologies Sector Committee |
| 11 | APPROVAL DATE AND NUMBER OF VQA's BOARD OF DIRECTORS  | 12/06/2013 - 2013/45 |

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13UY0165-6/A8 Maintenance and Troubleshooting in the Network and Server Systems

Date of Publication: 12/06/2013 Rev. No: 00

**ANNEXES**

ANNEX 13UY0165-6/A8-1: Information over Recommended Education for the Qualification Unit

For this unit, it is recommended to complete a training program that includes the following content.

**Content of Training:**

Software Maintenance and Repair Activities Hardware Maintenance and Repair Activities Software Fundamental Problem Identification and Resolution Hardware Fundamental Problem Identification and Resolution

ANNEX 13UY0165-6/A8-2: Checklist to be used in the Assessment of the Qualification Unit

**a) KNOWLEDGE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Description of Knowledge | NOS Related Dept | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.1 | Describes the points to consider (requirements, times, methods and storage conditions) while formulating the backup plan.  | J.1.1 | 1.1 | T1 |
| BG.2 | Describes how to activate the automatic backup and backup check cycles and follow up of their operation.  | J.1.2J.1.3 | 1.1 | T1 |
| BG.3 | Describes how to realize the backup before critical system operations (except the backups taken as standard).  | J.1.4 | 1.1 | T1 |
| BG.4 | Describes the points to pay attention while drawing up the recovery plans by designating data recovery methods and rules.  | J. 1.5 | 1.1 | T1 |
| BG.5 | Describes the aspects to pay attention while planning the cleaning and maintenance activities considering the using times of IT hardware.  | J.2.1 | 1.2 | T1 |
| BG.6 | Creates the maintenance plan documentation and to describe the aspects to pay attention while distributing the copies to all related personnel.  | J.2.2 | 1.2 | T1 |
| BG.7 | Describes how to ensure the realization of the maintenance plan on designated times.  | J.2.3 | 1.2 | T1 |
| BG.8 | Describes how to check up-to-date performance of the systems by following up the updates related to the operating systems and active network hardware products.  | J.2.4 | 1.2 | T1 |
| BG.9 | Describes how to ensure the identification of the software and hardware changes that are out of procedures.  | J.2.5 | 1.2 | T1 |
| BG.10 | Describes how to ensure feedback from system users.  | J.2.6 | 1.2 | T1 |
| BG.11 | Describes how to check the compatibility of the bandwidth taken from the service providers for Internet connection with the service level agreement.  | J.2.7 | 1.2 | T1 |

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| --- | --- | --- | --- | --- |
| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.12 | Describes how to observe the effects of power and environmental conditions on the IT hardware.  | J.2.8 | 1.2 | T1 |
| BG.13 | Describes what kind of corrective measures to take by following up the service cuts, security violations, and attacks to the network services.  | J.3.1 | 1.3 | T1 |
| BG.14 | Describes how to ensure the password change when the passwords of network hardware and wireless access points should be renewed.  | J.3.2 | 1.3 | T1 |
| BG.15 | Describes how to ensure the realization of the updating procedure by following up new updates for network hardware products.  | J.3.3 | 1.3 | T1 |
| BG.16 | Describes the points to pay attention while determining how to meet the existing and future server and network necessities.  | J.3.4 | 1.3 | T1 |
| BG.17 | Describes how to follow up the new products and updates by contacting the suppliers.  | J.3.5 | 1.3 | T1 |
| BG.18 | Describes how to ensure the security of the systems via up-to-date security software solutions by identifying the malware.  | J.4.1 | 1.3 | T1 |
| BG.19 | Describes the procedures to carry out by using disk maintenance tools (disk cleaning software, disk defragmentation software).  | J.4.2J.4.3 | 1.4 | T1 |
| BG.20 | Describes how to ensure the closure of the unnecessary programs or their removal from the system by observing the software products that start automatically at the opening of the system and/or continuously operate in the background. | J.4.4 | 1.4 | T1 |
| BG.21 | Describes the BIOS update task by checking the new versions of BIOS software, especially if it contains a significant improvement for the system.  | J.4.5 | 1.4 | T1 |
| BG.22 | Describes how to ensure the realization of the updates and patch installations for the operating system.  | J.4.6 | 1.4 | T1 |
| BG.23 | Describes how to ensure the installations of proper software products by evaluating the up-to-date or alternative versions of application software solutions.  | J.4.7 | 1.4 | T1 |
| BG.24 | Describes how to ensure the data security and confidentiality of the operation (use of the IT systems in accordance with their user instructions, laws and regulations).  | J.5.1 | 1.5 | T1 |
| BG.25 | Describes the points to pay attention while implementing the measures for protecting the confidentiality of the user information.  | J.5.2 | 1.5 | T1 |
| BG.26 | Identifies the potential risks of the computer systems for all the components and to describe the foreground actions to be designated as a measure against the potential risks, to a level approved by the upper management of the operation.  | J.5.3 | 1.5 | T1 |

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| --- | --- | --- | --- | --- |
| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.27 | Describes how to behave in accordance with the information technology law and information security (use of the information systems in accordance with their policies, laws and related legislation; not to make an attempt with a nature of attack to a system, network source or service out of the operation using the information sources, computer networks and Internet of the operation, etc.).  | J.5.3 | 1.5 | T1 |
| BG.28 | Describes the points to pay attention while receiving general information about a problem related to the IT systems in personal and common use by contacting the users.  | K.1.1 | 3.1 | T1 |
| BG.29 | Describes how to learn when, during or after which task the problem occurred.  | K.1.2 | 3.1 | T1 |
| BG.30 | Describes how to learn what the potential sound or written error notifications given by the IT hardware are.  | K.1.3 | 3.1 | T1 |
| BG.31 | Describes how to identify, if any, the negative effects of power and environmental conditions on the IT hardware.  | K.1.4 | 3.1 | T1 |
| BG.32 | Describes how to analyze the meanings of identified sound or written error notifications.  | K.1.5 | 3.1 | T1 |
| BG.33 | Describes how to identify the potential problems (using his/her own experience, problem/solution records in the digital archive and Internet research).  | K.1.6 | 3.1 | T1 |
| BG.34 | Describes how to ensure the necessary power supply of the IT hardware by checking the electrical connections and the power flow from the line.  | K.2.1 | 3.2 | T1 |
| BG.35 | Describes how to ensure the data connections between the IT hardware products to the corresponding connection points with proper cables.  | K.2.2 | 3.2 | T1 |
| BG.36 | Describes how to ensure clearing the interior of the case from foreign bodies, dust, liquid, etc. by opening the case covers of the IT hardware products.  | K.2.3 | 3.2 | T1 |
| BG.37 | Describes how to ensure the replacement of IT hardware products and/or internal components that have been exposed to physical damage at an irreparable level due to effects such as break, fracture, burn or liquid with the new ones.  | K.2.4 | 3.2 | T1 |
| BG.38 | Describes how to ensure the connection of power and data cables inside the cases of the IT hardware composed of mountable components, in accordance with technical documents.  | K.2.5 | 3.2 | T1 |
| BG.39 | Describes how to ensure the replacement of inactive cooling fans with the new ones.  | K.2.6 | 3.2 | T1 |
| BG.40 | Describes the points to pay attention while identifying the problems in the network configuration according to the data obtained through monitoring the network performance.  | K.3.1 | 3.3 | T1 |
| BG.41 | If the problem encountered is indicated in the disaster plan, describes how to check the conformity of the solution indicated in the plan and how to apply it.  | K.3.2 | 3.3 | T1 |
| BG.42 | Describes how to identify, if any, the negative effects of power and environmental conditions on the network hardware.  | K.3.3 | 3.3 | T1 |

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| --- | --- | --- | --- | --- |
| No | Description of Knowledge | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BG.43 | Shares the performance data with the software and hardware suppliers in accordance with the operation rules and to describe the aspects to pay attention while designating corrective measures for deviations from the values specified by the manufacturer.  | K.3.4 | 3.3 | T1 |
| BG.44 | Describes how to identify the hardware products to be removed from the network topology, or to be changed or added.  | K.3.5 | 3.3 | T1 |
| BG.45 | Identifies the network cables that are problematic or that do not meet the required speeds and to describe how to decide whether to repair, add or replace according to the cable type.  | K.3.6 | 3.3 | T1 |
| BG.46 | Describes the points to pay attention while identifying the locations that require new network cabling.  | K.3.7 | 3.3 | T1 |
| BG.47 | Notifies the changes to be made to the authorized network technologies specialist and to describe how to ensure the update of the existing network plan.  | K.3.8 | 3.3 | T1 |
| BG.48 | Describes how to ensure the implementation of the changes that have been deemed appropriate according to the updated network plan and their test.  | K.3.9 | 3.3 | T1 |
| BG.49 | Describes how to identify the source of the problems.  | K.4.1 | 3.4 | T1 |
| BG.50 | If the problem encountered is indicated in the disaster plan, describes how to check the conformity of the solution indicated in the plan and how to apply it.  | K.4.2 | 3.4 | T1 |
| BG.51 | Describes how to make the error identification by providing the special fault identification software for the hardware products that have a software support for fault identification and operate partially.  | K.4.3 | 3.4 | T1 |
| BG.52 | Describes how to operate the troubleshooting program in line with the instructions upon identification of an error and starts the action according to its results.  | K.4.4 | 3.4 | T1 |
| BG.53 | Describes the points to pay attention while reporting the problems and solutions.  | K.4.5 | 3.4 | T1 |

**b) SKILLS AND COMPETENCES**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Skill and Competence Description | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BY.1 | Backs up before critical system operations (except the backups taken as standard).  | J. 1.4 | 2.1 | P1 |
| BY.2 | Describes the points to pay attention while drawing up the recovery plans by designating data recovery methods and rules.  | J. 1.5 | 2.1 | P1 |
| BY.3 | Describes what kind of corrective measures to take by following up the service cuts, security violations, and attacks to the network services.  | J.3.1 | 2.2 | P1 |
| BY.4 | Ensures the necessary power supply of the servers by checking the electrical connections and the power flow from the line.  | K.2.1 | 4.1 | P2 |
| BY.5 | Ensures the connection of the data connections between the servers to the corresponding connection points with proper cables.  | K.2.2 | 4.1 | P2 |

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| --- | --- | --- | --- | --- |
| No | Skill and Competence Description | NOS Related Department | Qualification Unit Performance Criterion | Evaluation Mean |
| BY.6 | Identifies the source of hardware and software problems.  | K.4.1 | 4.2 | P2 |
| BY.7 | If the problem encountered is indicated in the disaster plan, checks the conformity of the solution indicated in the plan and to apply it.  | K.4.2 | 4.2 | P2 |
| BY.8 | Ensures the necessary power supply of the servers by checking the electrical connections in the network systems and the power flow from the line.  | K.2.1 | 4.1 | P3 |
| BY.9 | Connects the data connections between the network hardware products to the corresponding connection points with proper cables.  | K.2.2 | 4.1 | P3 |
| BY.10 | Identifies the source of hardware and software problems.  | K.4.1 | 4.2 | P3 |
| BY.11 | If the problem encountered is indicated in the disaster plan, checks the conformity of the solution indicated in the plan and to apply it.  | K.4.2 | 4.2 | P3 |
| BY.12 | Ensures the necessary power supply by checking the electrical connections in the backup systems and the power flow from the line.  | K.2.1 | 4.1 | P4 |
| BY.13 | Connects the data connections between the backup systems to the corresponding connection points with proper cables.  | K.2.2 | 4.1 | P4 |
| BY.14 | Identifies the source of hardware and software problems.  | K.4.1 | 4.2 | P4 |
| BY.15 | If the problem encountered is indicated in the disaster plan, checks the conformity of the solution indicated in the plan and to apply it.  | K.4.2 | 4.2 | P4 |

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**ANNEXES**

**ANNEX 1: Qualification Units**

1. 13UY0165-6/A1 OHS, Quality, Environmental Protection, Work Organization and Career Development
2. 13UY0165-6/A2 Fundamentals of Computer Hardware and Software
3. 13UY0165-6/A3 Fundamentals of Network Technologies
4. 13UY0165-6/A4 Fundamentals of Server Systems
5. 13UY0165-6/A5 Creating the Infrastructure of IT
6. 13UY0165-/A6 Configuration of the Network and Server Systems
7. 13UY0165-6/A7 Operation of the Systems and Applications
8. 13UY0165-6/A8 Maintenance and Troubleshooting in the Network and Server Systems **ANNEX 2: Terms, Symbols and Abbreviations**

OPEN-SOURCE CODED OPERATING SYSTEM: Computer operating system whose source code is open to everyone and which is generally distributed free of charge,

ADMIN (ADMINISTRATOR): Person who is fully authorized and responsible for the development of the system and resolution of the problems,

NETWORK NAME ANALYSIS SERVICE: Service that converts the digital identification information defining the device on the network to the names that can be more easily remembered by people,

NETWORK CONNECTION: Connection system which is established between several communication hardware products such as the server, printer, personal computer, modem and their peripherals that are in wired or wireless connection with a communication protocol, for the purpose of file sharing, communication, common application programs and use of data banks,

NETWORK HARDWARE: All electronic, electro mechanic and mechanic components with a network connection,

NETWORK SECURITY: Provisions and policies that ensure the use of all software and hardware products related to the network only by authorized persons and in a permitted scale,

NETWORK BACKBONE: Physical part of the computer network infrastructure that consists of active network hardware, network cables and connecting units that interconnect the end network hardware products,

NETWORK PERFORMANCE: Refers to the realization of the expected performance of the network hardware and software products and

the response of the network topology to the expected speed requirements.

NETWORK IDENTIFICATION SOFTWARE: Software that checks whether a specific software or hardware performs the expected network functions,

NETWORK TOPOLOGY: Refers to general plans that specify how the network hardware products are interconnected in terms of physical and software aspects and how they communicate with each other,

NETWORK MANAGEMENT SERVICE: Server services that are operated for the configuration of network hardware and software settings and their central management,

ACTIVE NETWORK HARDWARE: Special hardware used for the establishment of network backbone and creation of physical connection points,

ALERT: Warning boxes and alarm signal,

 MAINTENANCE: Activities that cover the replacement of worn, end-of-life pieces or parts that should be periodically changed of the related machine, hardware, tool or system, realization of cleaning and similar tasks, and the configuration of the settings according to the technical instructions and user guides.

MAINTENANCE PLAN: Planning the rules, methods and periods specified for the realization of maintenance activities,

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BANDWIDTH: Data transfer speed or capacity of the network communication channel,

BATCH: A set of data or jobs to be processed in the computer,

CBT: Computer Based Test

WORK GROUP: A user group where each of the interconnected computers in a local network has its own user account,

PERIPHERAL: An auxiliary hardware product such as an input - output unit or a communication unit that works in conjunction with a computer system.

ENVIRONMENTAL CONDITION REGULATOR: Special hardware that serve to regulate the characteristics of a location such as temperature, coolness, and moist,

CIRCUIT DIAGRAM: Diagram that shows the connections between the electrical or electronic hardware products,

DYNAMIC ROUTING: Ensuring that the routing tasks are realized by calculating the alternative transmission routes against network use intensity or any other faults,

INDEX SERVICE: Software service that keeps the information related to the physical and logic objects in a network, organizes them, carries out their central management, manages the access of the users to these,

DOMAIN: Work group that enables the central management in a network that has become too large for a single work group,

DOMAIN CONTROLLER: Server that manages the domain group,

HARDWARE: Electronic, electro mechanic and mechanic components of a network, computer or peripheral,

FILE SHARING SERVICE: Software service that enables the access of other software and hardware products to the indexes and files in a computer or special data storage system,

EVENT: Events that take place on the system,

DISASTER SCENARIO/PLAN: A set of events/plans that are required to be applied in case of the worst situations such as potential system crash, data complication or loss, security threat, etc.,

WIDE AREA NETWORK: Broad physical or logical networks that are created with communication rule conversion in order to send the data to remote distances,

FIREWALL: A software or hardware-based network security service that controls the incoming and outgoing network data packages based on applied rule set,

SECURITY BREACH: Previously designated behavior or system use that has the potential to partially or wholly deactivate the network hardware and software products,

SECURITY POLICY: A set of rules that will apply in the use of all hardware and software products in a network,

SECURITY SOFTWARE: Protection and instant check software that are developed for ensuring the protection of computer or other network hardware,

IBT: Internet Based Test

INFORMATION: Informative message,

IP ADDRESS: Communication address that is used for the data exchange between the network hardware and software products using the IP protocol and other hardware and software products,

IP ADDRESS DISTRIBUTION SERVICE: Software service that enables the central distribution of IP addresses to end devices and their management,

ISCO: International Standard Classification of Occupations,

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OHS: Occupational Health and Safety.

OPERATING SYSTEM: System software that is responsible for direct control and management of the computer or other network hardware resources, for main system tasks, file management and operation of the application programs,

WIRED NETWORK: Network that is established using the network cables,

WIRELESS NETWORK: Network that is established without the network cable, using wireless communication techniques,

WIRELESS NETWORK SECURITY: Specific security measures to be taken for wireless communication techniques,

WIRELESS ACCESS POINT: Active network hardware that enables the connection of wireless end network hardware products to each other and to other networks,

CALIBRATION: A set of measurements that is used for measuring the accuracy of a measurement or test tool by using another measurement standard or system with known accuracy, and for determining and documenting the deviations,

PERSONAL PROTECTIVE EQUIPMENT (PPE): Equipment designed to protect an employee from health and safety risks at work which can be worn, attached or held.

CONSOLE CONNECTION: Connection with an output monitor and data input hardware, for the tasks to be performed in network hardware products,

REPAIR: All of the tasks that consist of the identification and removal of the faults appearing in the related machine, hardware, tool or system,

RAID (REDUNDANT ARRAY OF INDEPENDENT DISK DRIVES): Data storage design that is made using more than one hard disk for data copying or sharing between the disks,

VIRTUALISATION: Refers to the technology that allows for the physical use of more than one computer on a computer through a platform established between the hardware and operating system,

SERVICE LEVEL AGREEMENT: A service contract signed with a service provider where the bandwidth and other characteristics of a wide area or Internet access are defined,

STATIC ROUTING: Realization of the routing tasks with fixed rules specified independently from the instant situations related to the network,

SERVER OPERATING SYSTEM: Operating system software designed specifically for providing software service over the network and for the network management,

SERVER SERVICE: Software services that are kept in continuous operation on a server operating system for the realization of specific objectives,

DANGER: A source or an instance of risk, peril or injury at work,

GROUNDING: Connection of all installation parts that are not under voltage to a conductive object (electrode) placed within the earth,

END NETWORK HARDWARE: Computer, server, printer and all other network hardware devices that are connected to the backbone composed of network cables and active network hardware,

NOS: National Occupation Standard,

UPS: Uninterruptible Power Supply,

REMOTE ACCESS: Software access to a network hardware via the network,

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DEFAULT ROUTE: Routing configuration to which all communication packages without a rule will be delivered within the routing task,

PROXY SERVER: An interface that checks and filters the incoming and outgoing data between networks,

DATA BACKUP: Tasks regarding the copying of hardware configuration values or other data backups to another location for reloading in case of a problem,

SOFTWARE: Computer programs that are necessary for the management of the hardware units that form the network hardware and computer system as well as the tasks of the users,

LAYOUT: Plan where the operation locations of network hardware products are determined according to the locations of physical characteristics of that location and the settlements of other elements according to the topology and architecture,

ROUTING: Refers to tasks regarding the determination of network interfaces between which the data package inputs and outputs will move on the basis of fixed or dynamic rules,

ROUTING PROTOCOL: A set of rules that enable the dynamic selection of the nodes to which data packages will be directed during the routing task,

**ANNEX 3: External and Internal Transfers**

Those who possess the VQA Vocational Qualification Certificate as System Manager (Level 5) National Qualification should participate to the exams of all qualification units within the scope of the related National Qualifications in order to obtain the VQA Vocational Qualification Certificate as System Manager (Level 6) National Qualification.

**ANNEX 4: Assessor Criteria**

Those who will be employed as assessors should meet the following condition:

- To be electronic or computer engineer and to have an experience of at least 3 years as system manager.

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