Level 3 Design and maintain ICT networks software components (7540-356)

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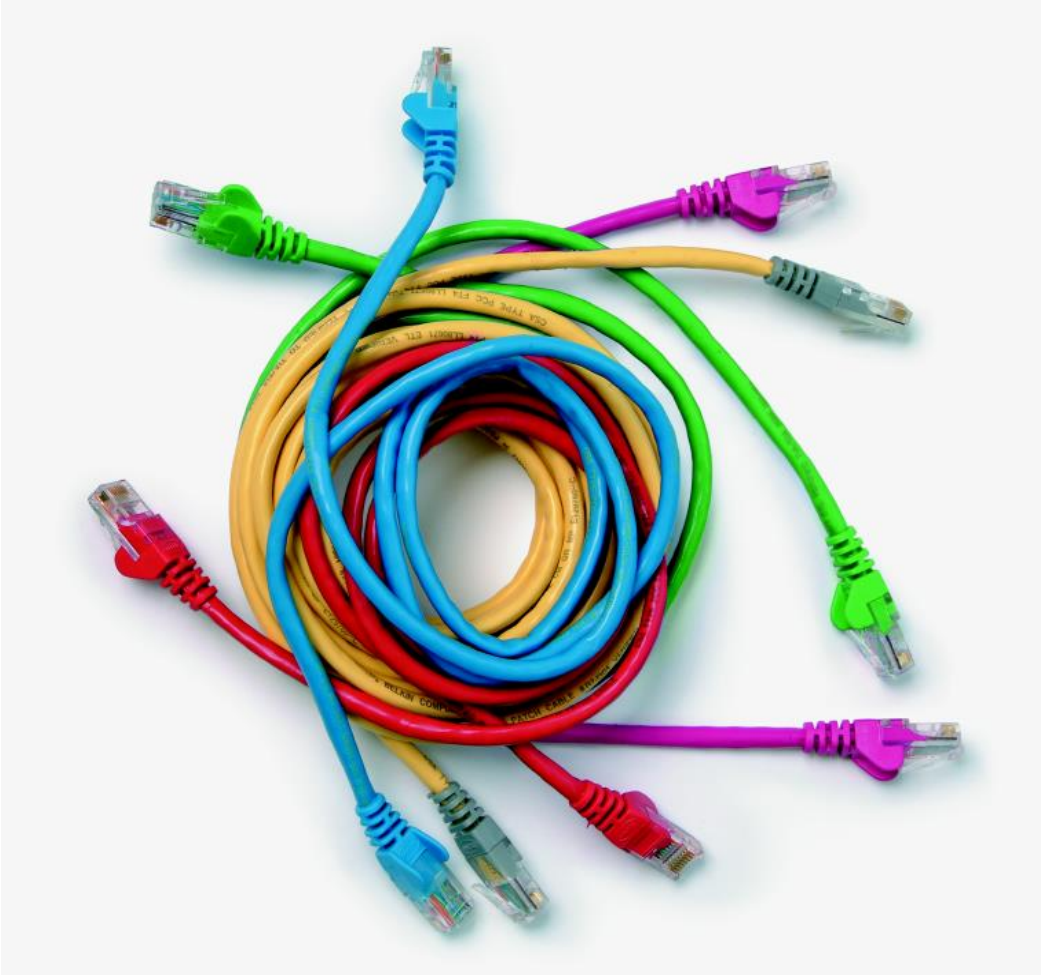
e-Quals
Assignment guide for Candidates
Assignment C



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Level 3 Design and maintain ICT networks software components (7540-356) Assignment C

Introduction – Information for Candidates

About this document

This assignment comprises all of the assessment for Level 3 Design and maintain ICT networks software components (7540-356).

Health and safety

You are asked to consider the importance of safe working practices at all times.

You are responsible for maintaining the safety of others as well as your own. Anyone behaving in an unsafe fashion will be stopped and a suitable warning given. You will **not** be allowed to continue with an assignment if you compromise any of the Health and Safety requirements. This may seem rather strict but, apart from the potentially unpleasant consequences, you must acquire the habits required for the workplace.

Time allowance

The recommended time allowance for this assignment is **4 hours**.

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Candidate Instructions

Time allowance: 4 hours

Assignment set up:

This assignment is made up of **four** tasks:

- Task A – Produce a routing table and encryption of data
- Task B – Explore priority queuing for a print server
- Task C – Explore procedures for a peer-to-peer network
- Task D – Explore communications software for protocols

Scenario

Elite Communications specialise in networking and data communications software development. They have been hired to provide solutions for a client's communications problems. As an employee of Elite Communications, your team leader has assigned you the task of providing solutions.

Note

Some tasks require candidates to write algorithms. Where this is the case you should always identify:

- variable names and data types
- argument names and data types
- return values and data types.

Task A – Produce a routing table and encryption of data

Diagram 1 represents a WAN used by Data Comms Experts where A, B, C, D and E are switching nodes. Host 1 can communicate with Host 2 via any available node. Each link between the switching nodes has been given a number.

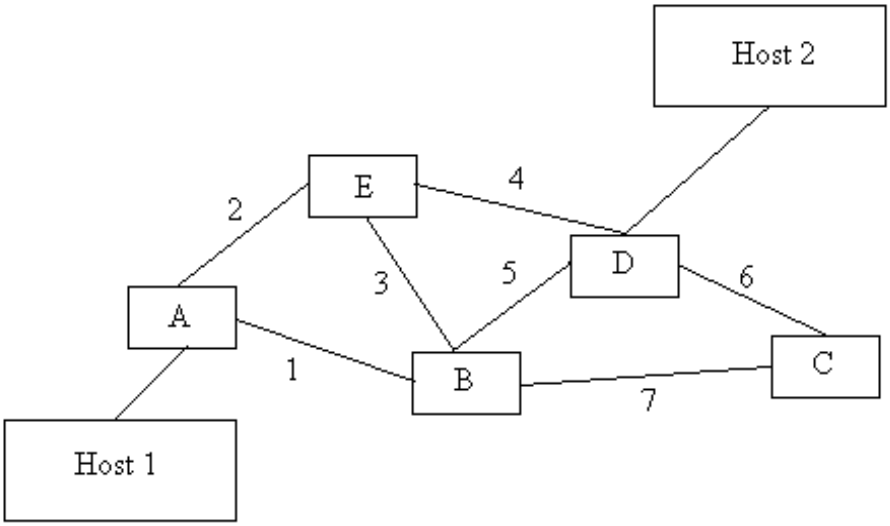

Diagram 1

Table 1 is a fixed routing table stored on node B. On receipt of a transmitted message, node B will look up the destination node in Table 1 to find which link to use to retransmit the message on. If a 0 entry is found, this indicates that the transmission is intended for itself and is not for retransmission.

Destination node	Link to transmit on	Alternative 1	Alternative 2
A	1	3	5
B	0	0	0
C	7	5	3
D	5	7	3
E	3	5	1

Table 1

1 Provide a routing table for node C. Label this **Routing Table 1**.

Continued over…

2 A bit manipulation method is to be used to encrypt the character data transmitted across the network. The logical operator XOR will be applied to each byte using the following binary key.

Key	01010011

- XOR the following 4 bytes with the key to show the encrypted data that will be transmitted.

Byte 1	01100101
Byte 2	01100110
Byte 3	01100111
Byte 4	01100010

- XOR the result of the encryption of the 4 bytes with the key to show the result of decrypting the data at the receiver.

Task B – Explore priority queuing for a print server

The client requires a priority system to be set up for the printer server as some important printing jobs are being delayed.

Your team leader has devised the following table named **JobList** to hold the details of jobs to be printed. Jobs are entered into the table in the order in which they arrive. Jobs are given a priority rating from 1 to 3 with rating 1 being the top priority.

Job Number	Filename	Priority Rating
1	P001	2
2	P002	3
3	P003	2
4	P004	3
5	P005	1
6	P006	2
7	P007	1

JobList Table

New jobs are added to the end of the queue.

1 Provide an algorithm for a function named PrintJob that will hold the table JobList. The function PrintJob will receive a request for printing and will search the table JobList for the job with the highest priority and return this job's filename as the next job to be printed. The job released for printing should be removed from the table JobList. If the table JobList is empty an empty filename must be returned.

Continued over…

2 Verify the results from your algorithm using the following two sets of test data.

- The data in the JobList table.
- The data shown below in Table 2.

Job Number	Filename	Priority Rating
1	P001	3
2	P002	1
3	P003	1
4	P004	3
5	P005	1
6	P006	3
7	P007	3

Table 2

Task C – Explore procedures for a peer-to-peer network

Diagram 2 shows a peer-to-peer network connecting four computers (A, B, C and D) built by your team leader. Printer X is connected to computer B as a local printer. Printer Y is connected to computer D as a local printer.

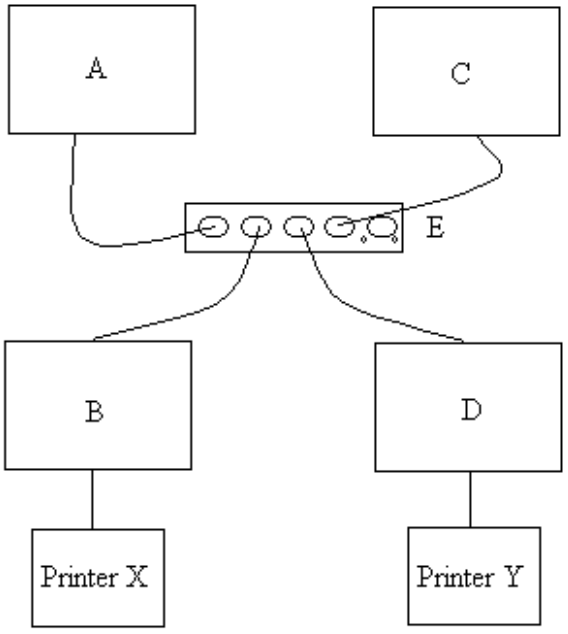

Diagram 2

You have been asked by your team leader to write a report about the use of the peer-to-peer network. This report will be called **Peer-to-peer Report 1**.

1 What hardware device shown in Diagram 2 as E is used to connect the four computers?

Continued over…

2 Describe the hardware device that must be installed in each computer to allow connection to device E.

3 Explain what hardware device can be used to connect two more computers to the network and how it would be connected.

4 Printers X and Y are connected to computers B and D on the network as local printers. Explain how computers A and B can access the printers.

5 Describe a suitable protocol that must be installed to allow communications to take place between the computers.

6 Computer A is to be connected to the Internet. Explain the purpose of Firewall software.

7 Explain the terms client/server in relation to a peer-to-peer network.

8 Describe the security procedures available for a peer-to-peer network.

Task D – Explore communications software for protocols

Your team leader has asked you to design a software component, which will link two computers using the Xmodem protocol. Diagram 3 is the State Transition Diagram for the transmitter software.

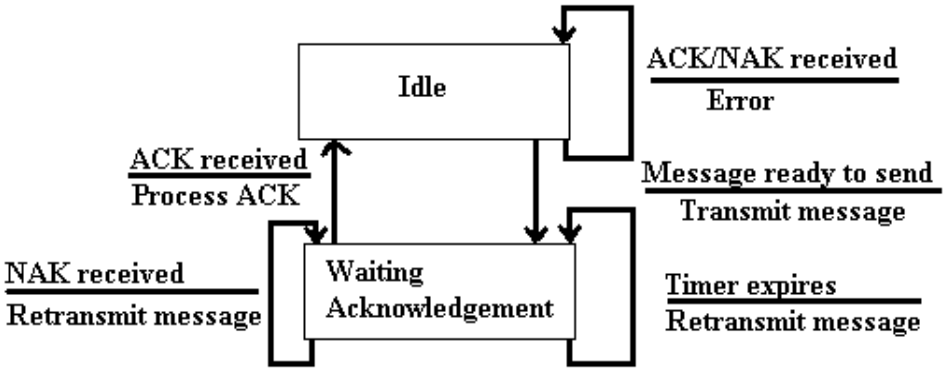

Diagram 3

Continued over…

Table 3 is the Event-state table for the transmitter.

Event / Present State	Timer Expires	Message ready to send	ACK received	NAK received	
Idle (0)	NA	Tx	Error	Error	**Action**
	0	1	0	0	**New State**
Waiting Acknowledgment (1)	Tx	Delay	Process ACK	Tx	**Action**
	1	1	0	1	**New State**

Table 3

Tx: Transmit message
NA: No action
Delay: Wait for a defined time: eg 10 seconds

1 Provide a State Transition Diagram for the receiver. This will be called **State Transition Diagram 1**.

2 Provide the Event-state table for the receiver. This will be called **Event-state Table 1.**

3 Provide an algorithm for the receiver software component using the information in Event-state Table 1. An incoming message will contain an identification number. The data received is to be written to disk in a sequential file. The algorithm must check for duplicate messages and errors in transmission: (ie checksum).

4 Provide an algorithm for the transmitter software component using the information in Table 3. An outgoing message should contain an identification number, which is incremented for each message sent. An ErrorLog is to be created to hold a count of the number of errors that have occurred. The data to be transmitted will be provided by another software component in a sequential file.

When you have finished working:

- Sign each document above your name and label all removable storage media with your name.
- Hand all paperwork and removable storage media to your assessor.

If the assignment is taken over more than one period, all paperwork and removable media must be returned to the test supervisor at the end of each sitting.

End of assignment

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