BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

COMPUTER NETWORKS

Friday 27th September 2013 – Morning
Answer **any** FOUR questions out of SIX. All questions carry equal marks

Time: TWO hours

Answer any <u>Section A</u> questions you attempt in <u>Answer Book A</u>
Answer any <u>Section B</u> questions you attempt in <u>Answer Book B</u>

The marks given in brackets are **indicative** of the weight given to each part of the question.

Only **non-programmable** calculators are allowed in this examination.

Section A

Answer Section A questions in Answer Book A

A1.

This question is about fibre optic transmission systems.

a) Explain how data is transmitted along a fibre optic cable and what advantages
fibre optics has over copper cable.

(12 marks)

b) Briefly explain how wave division multiplexing (WDM) is able to increase the
amount of data that can be transmitted along a single fibre optic cable.

(6 marks)

c) A fibre optic transmission system uses wave division multiplexing with 16
different wavelengths of light. Each of these wavelengths is able to operate at
1Gbps. If it requires 64,000bps to transmit an uncompressed telephone call,
determine the maximum number of telephone calls that can be transmitted at the
same time using this fibre optic cable.

(7 marks)

A2.

This question is about the service provided by the Transmission Control Protocol
(TCP) and User Datagram Protocol (UDP).

a) What is the difference in the service offered to applications by the TCP and UDP
protocols?

(8 marks)

Turn over]

b) For each of the following applications determine whether you would use TCP or UDP and explain the reasons for your choice.

    i. File transfer

    ii. Watching a real time streamed video

    iii. Web browsing

    iv. A Voice over IP (VoIP) telephone conversation

(4x3 = 12 marks)

c) Both TCP and UDP provide port numbers. What are these port numbers used for?

(5 marks)

A3.

This question is about the ISO Reference Model.

a) The ISO Reference Model defines seven protocol layers, each of which is responsible for a specific range of functions. By considering this model, explain the main functions performed by a protocol operating at:

    i. The Data Link layer

(5 marks)

    ii. The Network layer

(5 marks)

b) Figure 1 shows a small scale network comprising one switch and one router. A personal computer is connected to the switch and a server is connected to the router. All switch and router ports are IEEE 802.3 CSMA/CD.

For this network, consider data being sent from the personal computer to the server and draw a protocol layer diagram that clearly shows which layers of the ISO Reference Model would be used within the personal computer, switch, router and server.
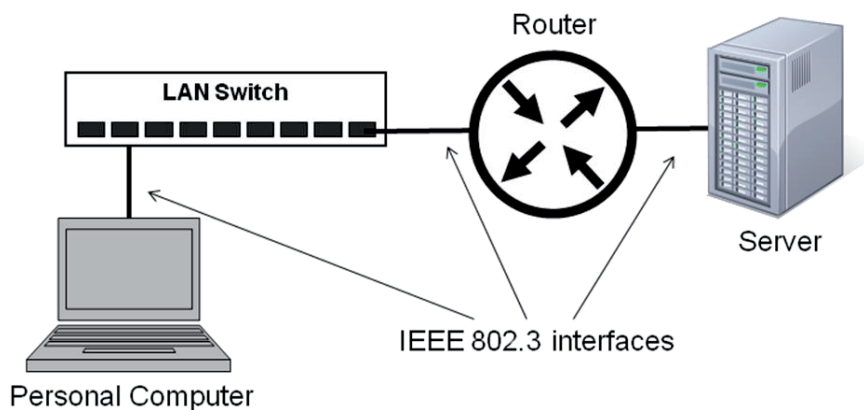
(15 marks)

Figure 1

Section B

Answer Section B questions in Answer Book B

B4.

This question is about the service typically offered by an internet and some applications' requirements for specific qualities of service (QoS).

a) The internet is traditionally described as only being a "best effort" network. Explain what people mean by that term and why the standard configuration of internet connections and routers only provides such a service.

(8 marks)

b) Explain the network QoS needs of a service such as IP videoconferencing and explain why these will typically not be met in a network that only provides a "best effort" service.

(8 marks)

c) What actions can a router take if it wishes some IP packets to be given a service different to that provided by "best effort"

(9 marks)

B5.

Wireless Local Area Networks (WLANs) have become very important to many organisations. This question is about the technology normally known as WiFi (IEEE802.11).

a) Briefly explain the difference between the terms infrastructure and ad-hoc when used to describe the operational modes of a WiFi and the equipment required in each case.

(**8 marks)**

b) Explain the problems created by the presence of what are normally called hidden nodes in a WiFi network and how these are often addressed.

(10 marks)

c) Explain why many WiFi networks can have a high error rate caused by co-channel interference.

(7 marks)

Turn over]

B6.

This question is about network design.

Imagine you are a consultant being asked to provide advice on the design of a new network. A company is moving onto a new industrial estate and will be taking over the use of three buildings (A, B and C). The buildings are only 40 metres apart and the company is aware that a network of underground cable ducts exists linking the three buildings. All the buildings only have one floor and each measure about 50 metres by 20 metres. The company will be operating several web servers which are intended to be accessible from external locations by customers.

Building A contains the company's main computer room which holds the web servers and also contains several database and fileservers used by the company's staff. The building also contains the offices of some development staff who have very high performance desktop computers. Their computers interactively exchange large amounts of data with some of the servers.

Building B contains the office of the clerical staff. They have relatively low performance desktop computers and their desks are in fixed locations. The workers only exchange a small amount of data with the servers.

Building C contains the staff cafe and a lounge area. There are also areas used to welcome customers. Much of the building is open plan and the furniture is regularly moved around.

a)   What type of networking should be installed in building A and what equipment or other facilities would you need?

(5 marks)

b)   What type of networking should be installed in building B and what equipment or other facilities would you need?

(5 marks)

c)   What type of networking should be installed in building C and what equipment or other facilities would you need? How will you try to provide internet access for visiting customers without compromising the safety of the company's own computers?

(8 marks)

d)   What type of networking and equipment should be used to link together the three buildings and how will overall Internet access be provided for the company?

(7 marks)