

UNIVERSITY OF EMBU

2016/2017 ACADEMIC YEAR

SECOND SEMESTER EXAMINATION

FIRST YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN
COMPUTER SCIENCE

CSC 226: COMPUTER SYSTEM AND NETWORKING LAB

DATE: APRIL 10, 2017

TIME: 2:00-4:00PM

INSTRUCTIONS:

Answer Question ONE and ANY Other TWO Questions.

QUESTION ONE (30 MARKS)

- a) Describe a router is and give an example place where it is used in the network (3 marks)
 - b) Describe the following protocols in detail (6 marks)
 - i. SMTP
 - ii. DHCP
 - iii. DNS
 - c) The Internet is often described as only offering a “best effort” service. What do people mean by describing it this way? (5 marks)
 - d) What is the difference between a Virtual Path and a Virtual Channel? (5 marks)
 - e) Both the TCP and UDP protocols use port numbers. What are these port numbers used for and what is meant by the term well known port? (6 marks)
 - f) The data link layer in the IEEE standard is divided into two sublayers: LLC and MAC. Indicate the functions performed by each sublayer. (5 marks)
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QUESTION TWO (20 MARKS)

- 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 Physical layer (2 marks)
 - ii. The Transport layer (2 marks)
 - iii. What is meant by the term peer to peer protocol? (2 marks)
- b) Give one example of a device on a network that is required to operate all seven layers of the OSI Reference Model. (2 marks)
- c) Figure 1 shows part of a network in which two personal computers A and B, are each connected to a switch (LAN switch 1 and 2) which are themselves interconnected by a router. Consider the transmission of data from personal computer A to B and produce a protocol layer diagram that clearly shows how data passes through all of the layers of the ISO Reference model that are used within the PCs, switches and router. (12 marks)

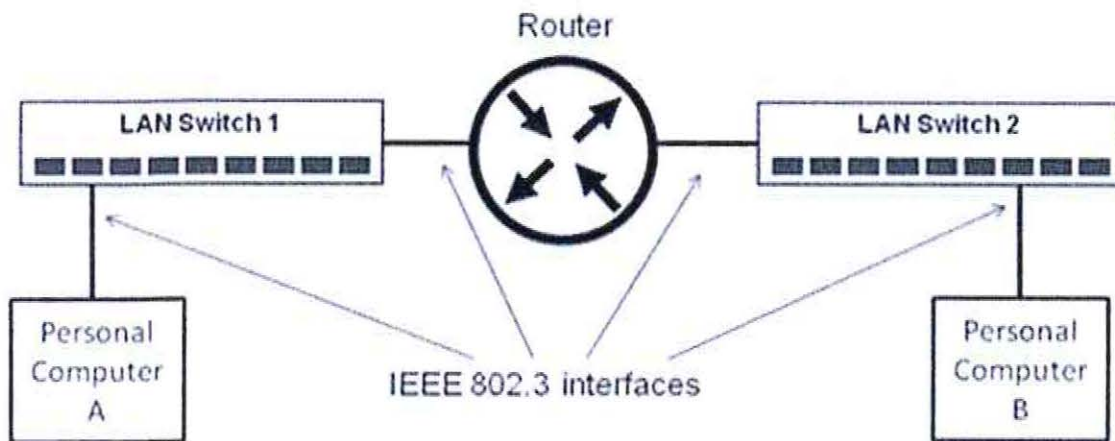


Figure 1

QUESTION THREE (20 MARKS)

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? (6 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? (4 marks)

QUESTION FOUR (20 MARKS)

- a) Explain how data is transmitted along a fibre optic cable. (4 marks)
- b) Identify three physical characteristics of fibre optic cables that make them more suitable for high speed digital data transmission than copper cables. (6 marks)
- c) Describe what is meant by wave division multiplexing (WDM) and explain how it is used to deliver high rate data transmission over a fibre optic cable. (4 marks)
- d) A fibre optic transmission system uses wave division multiplexing with 16 different wavelengths of light. Each of these wavelengths is able to operate at 2.5Gbps. What is the maximum data carrying capacity of this transmission system? If you require 4Mbps to stream one high definition video, determine how many such videos could be transmitted at the same time using this fibre optic transmission system. (6 marks)

QUESTION FIVE (20 MARKS)

- a) Describe two different sources a router can use to put/maintain the information contained in the routing table. (4 marks)
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- b) Indicate two main differences between link-state and distance-vector routing protocols.(4 marks)
- c) Indicate the type of routing protocol (distance-vector or link-state) and the metric used by each of the following protocols: (6 marks)
- RIPv1
 - EIGRP
 - OSPF
- d) Briefly describe the link-state protocol known as OSPF and explain how it copes with routing inside a large and complex autonomous system. (6 marks)

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