

UNIVERSITY OF BOLTON

**SCHOOL OF BUSINESS AND CREATIVE
TECHNOLOGIES**

SEMESTER 1 EXAMINATION 2009/2010

COMPUTING PATHWAYS

NETWORKS AND COMMUNICATIONS

MODULE NO: CST 2507

Date: Wednesday 20th January 2010

Time: 2.00 – 4.00pm

INSTRUCTIONS TO CANDIDATES:

There are SIX questions.

Answer Question 1 and ANY **THREE** other questions.

All questions carry equal marks.

Marks for parts of questions are shown in brackets.

Unless otherwise stated all symbols take their usual meaning.

Electronic calculators may be used provided that data and program storage memory is cleared prior to the examination.

Question 1

This is a multiple choice question consisting of twenty five parts each carrying equal marks. Each part has four possible answers of which ONLY ONE is correct. To indicate your selection you should write down the question number and indicate which answer you have selected. For example in the Example question below, February has less than thirty days, so write down the question number and answer c).

Example Question

Which month has less than thirty days?

- a) January
- b) March
- c) February
- d) October

- 1) Which of the following is an invalid MAC address?
 - a) 11111111 11111111 11111111 00000000 10101010 11100011
 - b) 00-78-29-4F-4E-4D
 - c) 00-90-2A-92-45-6A
 - d) 00-87-34-8F-7A-45

- 2) Which of the following is a class C IP address?
 - a) 18.34.67.2
 - b) 193.192.48.6
 - c) 225.0.100.5
 - d) 85.34.98.4

- 3) Which of the following are appropriate units for stating analog bandwidth?
 - a) GHz
 - b) Bytes
 - c) kBps
 - d) GBps

- 4) Which is the correct termination type for a satellite receiver cable?
 - a) BNC
 - b) 'N' type
 - c) SMC
 - d) 'F' type

- 5) What does the most significant half of a NIC physical address signify?
 - a) The NIC manufacturer's identification code
 - b) The maximum bandwidth of the NIC
 - c) The IP address associated with the NIC
 - d) The mother board insertion point identifier

Question 1 continued over page

Question 1 continued

- 6) What does PDH stand for?
 - a) Packet Data Home
 - b) Packet Distributed Hierarchy
 - c) Packet Data Hierarchy
 - d) Plesiochronous Digital Hierarchy

- 7) Which of the following devices operates primarily in the data link layer?
 - a) Hub
 - b) LAN Switch
 - c) Router
 - d) Repeater

- 8) Which of the following cables is used in the initial configuration of a router?
 - a) Roll over
 - b) Cross over
 - c) Straight through
 - d) USB

- 9) Which of the following is used in Pulse Code Modulation systems?
 - a) Pulse Position Modulation
 - b) Quantisation
 - c) Frequency Division Multiplexing
 - d) Synchronous Digital Frames

- 10) Which of the following IP addresses is a private address?
 - a) 11.0.0.0
 - b) 126.0.0.1
 - c) 172.16.0.0
 - d) 193.168.246.16

- 11) Which of the following is used in a PCM system?
 - a) PAM
 - b) PIM
 - c) POM
 - d) PUM

- 12) Which of the following is not possible in a LAN switch?
 - a) MAC address learning
 - b) IP address manipulation
 - c) VLAN function
 - d) Remote SNMP configuration

Question 1 continued over page

Question 1 continued

- 13) Which of the following is not used in Wireless Networks?
- a) WPA
 - b) ZIP
 - c) WEP
 - d) AP
- 14) Which of the following is not a type of radio polarisation?
- a) Vertical
 - b) Slant
 - c) Parabolic beam
 - d) Horizontal
- 15) Which class C subnet mask specifies up to 2 theoretical subnets?
- a) 255.255.255.224
 - b) 255.255.255.192
 - c) 255.255.255.240
 - d) 255.255.255.128
- 16) Which of the following is the OSI layer 4 PDU?
- a) Bit
 - b) Frame
 - c) Packet
 - d) Segment
- 17) Which class C address and mask specifies up to 4 theoretical subnets ?
- a) 192.168.100.0/27
 - b) 192.168.100.0/26
 - c) 192.168.100.0/25
 - d) 192.168.100.0/28
- 18) Which of the following is not a network interface card term?
- a) NAT address
 - b) MAC address
 - c) Hardware Address
 - d) Physical Address

Question 1 continued over page

Question 1 continued

- 19) Which of the following describes the 5:4:3 repeater rule?
- a) 5 segments, 4 repeaters, 3 LANs
 - b) 5 segments, 4 responders, 3 connected segments
 - c) 5 segments, 4 repeaters, 3 connected segments
 - d) 5 segments, 4 repeaters, 3 WANs
- 20) Which of these cables is used to connect a PC to a PC?
- a) cross-over
 - b) straight-through
 - c) roll-over
 - d) console
- 21) What device is capable of segmenting collision domains but not broadcast domains?
- a) LAN Switch
 - b) Hub
 - c) Router
 - d) Repeater
- 22) Which of the following is unusable?
- a) 192.168.200.0/31
 - b) 192.168.200.0/27
 - c) 192.168.200.0/28
 - d) 192.168.200.0/29
- 23) Which of the following is not used in mobile networks?
- a) TDMA
 - b) MAP
 - c) WPA
 - d) CDMA
- 24) Which of the following devices operates exclusively in OSI layer 1?
- a) Router
 - b) Switch
 - c) Layer 3 Switch
 - d) Hub
- 25) What does LNB mean?
- a) Low Noise Baffle
 - b) Low Noise Boot
 - c) Low Noise Block
 - d) Low Noise Bracket

Please turn the page

Question 2

- 2a)** Compare and contrast how collision and broadcast domains are segmented. Give examples of devices operating in the lower layers (1 to 3) of the OSI 7-layer model. **[8 Marks]**
- 2b)** With reference Ethernet repeaters, describe the 5:4:3 rule that applies. Indicate the reasons why there is this limitation in a LAN. **[6 Marks]**
- 2c)** Describe the physical construction of UTP, STP and optical fiber cables. **[6 Marks]**
- 2d)** Discuss the factors, advantages and disadvantages, why a network administrator might choose to replace a network HUB with a network Switch. **[5 marks]**

Question 3

- 3a)** Define what is meant by the term encapsulation as it is applied to data networks. It will be useful to include in your answer reference to the OSI 7-layer model. **[4 Marks]**
- 3b)** Describe how Ethernet systems can eliminate problems due to collision of frames in a LAN segment. **[5 Marks]**
- 3c)** Using examples of host machines, hubs, switches and routers describe when would you use the following cables in LANs?
- i. A straight-through cable
 - ii. A cross-over cable
- [6 Marks]**
- 3d)** If a six level signal is sent over a 3.6kHz bandwidth channel which has a signal to noise ratio $SNR = 27dB$, what is the maximum achievable data rate? Consider both the Shannon limit and the Nyquist limit. Take the lowest figure as the answer. **[10 Marks]**

Please turn the page

Question 4

- 4a)** Describe how routers communicate with other routers, in particular explain the following:
1. The difference between routed and routing protocols
 2. The simplified internet routing process from incoming packet, decision processes and outgoing packet
- [9 Marks]**
- 4b)** For the network 196.16.24.0/28 create a table showing the range of IP addresses for all of the available subnets stating the subnet address, the addresses of the first and last host and the subnet broadcast address. Explain why not all hosts are useable and why in some circumstances you cannot use all subnets?
- [8 Marks]**
- 4c)** With reference to part 'b', what is the effect of changing the subnet mask to:
- i. 255.255.255.192
 - ii. 255.255.255.248
- with respect to the number of subnets and the number of hosts per subnet.
- [4 Marks]**
- 4d)** Describe how 'Private ' IP addresses can help conserve addresses in LAN designs.
- [4 Marks]**

Question 5

- 5a)** With the aid of diagrams explain how Pulse Code Modulation (PCM) operates in a communications multiplexer. Include details of all phases of conversion from analogue through to digital output stream.
- [12 Marks]**
- 5b)** With the aid of a diagram, describe how the PDH mux mountain problem is overcome with add/drop SDH multiplexors.
- [4 Marks]**

Question 5 continued over page

Question 5 continued

5c) A radio link comprises of the following components:

- | | |
|---------------------------|--------|
| 1. Transmit power | 20dBm |
| 2. Receive sensitivity | -85dBm |
| 3. Antenna gain per end | 23dBi |
| 4. Coaxial loss per end | 4.8dB |
| 5. Connector loss per end | 0.6dB |
| 6. Fade margin required | 10dB |

Calculate the overall received signal strength and deduce whether the system has at least 10dB of fade margin. The link operates at 2.5Ghz over a link distance of 10 miles. Free space propagation loss is given by the formula:

$$L_p = 36.6 + 20\log(d) + 20\log(f) \quad \text{with } d \text{ in miles and } f \text{ in MHz.}$$

Suggest ways in which the fade margin can be improved.

[9 Marks]

Question 6

6a) Describe what the Fresnel Zone is in radio systems. Include details of techniques that improve radio link performance if the path is partially obstructed or suffers with reflections.

[6 Marks]

6b) Describe the fundamental relationship between wavelength and frequency and hence calculate what the wavelength of a 800MHz signal is? **[3 Marks]**

6c) With the aid of diagrams explain the following terms used in WLAN networks:

1. BSS
2. IBSS
3. EBSS
4. Root Mode
5. Bridge Mode
6. Active Scanning

[12 Marks]

6d) Outline the mechanism which enables hidden nodes in a WLAN network to communicate effectively.

[4 Marks]

END OF QUESTIONS