

UNIVERSITY OF BOLTON
SCHOOL OF BUSINESS & CREATIVE
TECHNOLOGIES
COMPUTING TECHNOLOGIES
SEMESTER 1 EXAMINATION 2010/2011
NETWORKS & COMMUNICATIONS
MODULE NO: CST 2507

Date: Monday 17th January 2011

Time: 14:00 – 16:00

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.

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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 not an OSI layer?
 - a) Physical
 - b) Network Access
 - c) Transport
 - d) Session

- 2) Which of the following is a class A, IP address?
 - a) 18.34.67.2
 - b) 193.192.48.6
 - c) 225.0.100.5
 - d) 192.168.1.1

- 3) Which of the following is the correct sequence of data encapsulation?
 - a) Bits, Bytes, Packets, Segments, Data
 - b) Bits, Packets, Datagrams, Segments, Data
 - c) Bits, Packets, Frames, Segments, Data
 - d) Bits, Frames, Packets, Segments, Data

- 4) Which is the correct termination type for a UTP cable?
 - a) BNC
 - b) 'N' type
 - c) RJ-45
 - d) 'F' type

Question 1 continues over the page....

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Question 1 continues....

- 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

- 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 Network 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) 192.168.0.0
 - d) 193.168.246.16

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Question 1 continued....

11) Which of the following is the Nyquist formula for maximum data rate?

- a) $= 2W \log_2 M$
- b) $= W \log_2(1 + S/N)$
- c) $= 2W \log M$
- d) $= 2W \log(1 + S/N)$

12) Which of the following is not possible in a LAN layer 2 switch?

- a) MAC address learning
- b) IP address manipulation
- c) VLAN function
- d) Remote SNMP configuration

13) Which of the following is used in Wireless Networks?

- a) WBA
- b) ZIP
- c) WPA
- d) APW

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 4 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 Network Layer PDU?

- a) Bit
- b) Frame
- c) Packet
- d) Segment

Question 1 continues over the page....

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Question 1 continued....

17) Which class C address and mask specifies up to 8 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

19) Which of the following is not an integral part of DHCP operation?

- a) Offer
- b) Request
- c) Accept
- d) Acknowledge

20) Which of these is not a radio link term?

- a) Fresnel Zone
- b) Frequency Marker
- c) Fade Margin
- d) Free Space Loss

21) What device is capable of segmenting collision domains and 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

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Question 1 continued....

23) Which of the following is not used in mobile networks?

- a) TDMA
- b) MAP
- c) WPA
- d) CDMA

24) What does MPLS mean?

- a) Main Plesiochronous Latency System
- b) Multi Plesiochronous Label Switch
- c) Maximum Protection Layer System
- d) Multi Protocol Label Switching

25) What does LNB mean?

- a) Low Noise Baffle
- b) Low Noise Boot
- c) Low Noise Block
- d) Low Noise Bracket

Question 2

2a) Compare and contrast Token Ring and Ethernet over CSMA/CD networks.

[8 Marks]

2b) With reference to Ethernet repeaters and Hubs, describe what is meant by Full Duplex and Half Duplex operation. Include a definition of Simplex communication.

[6 Marks]

2c) Describe the two most common layer models, OSI and TCP/IP. Include details of what each layer does and where networking devices map to.

[11 Marks]

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Question 3

- 3a)** Explain with the aid of a diagram the communication flow across a series of three routers in a line. Define what happens at each leg of the path in terms of MAC and IP addresses. **[8 Marks]**
- 3b)** Describe how to troubleshoot network problems in a LAN. Explain what tools you would use and what strategy you would adopt. **[7 Marks]**
- 3c)** If an eight level signal is sent over a 3.2kHz bandwidth channel which has a signal to noise ratio SNR = 29dB, 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]**

Question 4

- 4a)** Describe how routers operate and communicate with other routers in a network. Include details of how incoming packets are handled and processed and how routers communicate with one another using a variety of protocols. **[10 Marks]**
- 4b)** For the network 196.46.24.0/27 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? **[9 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
 - iii. 255.255.255.128

with respect to the number of subnets and the number of hosts per subnet. **[6 Marks]**

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Question 5

5a) With the aid of diagrams explain how ATM operates in a communications network. Include details of cell format, handling different types of incoming streams and the use of virtual connectivity. Explain how the limitations of ATM have been overcome by MPLS.

[15 Marks]

5b) 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 2.52Ghz over a link distance of 12 miles. Free space propagation loss is given by the formula:

$$L_p = 36.6 + 20\log(d) + 20\log(f)$$

with d in miles and f in MHz.

Suggest ways in which the fade margin can be improved.

[10 Marks]

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Question 6

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

1. BSS
2. IBSS
3. EBSS
4. Root Mode
5. WEP
6. RTS/CTS.
7. MAC Filter
8. RADIUS
9. Authenticated/Associated

[18 Marks]

6b) Describe how you would troubleshoot WLAN problems that seemed to be caused by interference. What steps would you take, what equipment would you use and how might you configure the network to get around these problems?

[7 Marks]

END OF QUESTIONS