UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (*EXTERNAL*)

Academic Year 2004/2005 – 2nd Year Examination – Semester 4

IT4102 – Data Communications and Networks

PART 1 - Multiple Choice Question Paper

13th August, 2005
(ONE AND A HALF HOURS)

Important Instructions:

- The duration of the paper is **1 ½ (one and a half) hours.**
- The medium of instruction and questions is English.
- The paper has **40** questions and **08** pages.
- All questions are of the MCQ (Multiple Choice Questions) type.
- All questions should be answered.
- Each question will have 5 (five) choices with one or more correct answers.
- All questions will carry equal marks.
- There will be a penalty for incorrect responses to discourage guessing.
- The mark given for a question will vary from –1 (*All the incorrect choices are marked & no correct choices are marked*) to +1 (*All the correct choices are marked & no incorrect choices are marked*).
- Answers should be marked on the special answer sheet provided.
- Note that questions appear on both sides of the paper.
  If a page is not printed, please inform the supervisor immediately.
- Mark the correct choices on the question paper first and then transfer them to the given answer sheet which will be machine marked. **Please completely read and follow the instructions given on the other side of the answer sheet before you shade your correct choices**.

1) Which of the following issues would affect the maximum data rate of a signal that can be transmitted through a channel?

(a) attenuation distortion	(b) bandwidth	(c) noise level
(d) delay distortion	(e) sampling rate	

2) Which of the following statements can be true with regard to a unit amplitude rectangular pulse of duration τ, with a period T?

(a) T can never be less than τ.
(b) Frequency components of the pulse will be spaced at $1/\tau$ intervals.
(c) Frequency components of the pulse will be spaced at 1/T intervals.
(d) If $\tau \rightarrow 0$, then all frequency components will be of equal amplitude.
(e) A pulse with $\tau \rightarrow 0$ and $T \rightarrow \infty$ could be used as a test signal to check the frequency response of a channel.

3) Which of the following statements is/are true with regard to digital transmission over a channel?

(a) The main effect of limited bandwidth on the signal would be to distort its physical shape.
(b) Physically distorted signals are required to be regenerated before retransmission onto the channel.
(c) Self clocking information can be provided by RTZ transitions in the signal.
(d) The direct current (dc) component of a digital signal has no effect on its ability to propagate over a channel.
(e) Digital transmission over wireless channels always require modulation into a continuous carrier signal.

4) Which of the following statements is/are true about a fibre optic cable as a wired transmission media?

(a) Physical installation has to be done with due care, especially the bend radius and terminations.
(b) Single mode fibres do not have modal dispersion and hence could support higher data rates.
(c) It is not susceptible to electro-magnetic interference unlike copper cables.
(d) Multimode fibres could utilise specialised multiplexing techniques to increase the bandwidth.
(e) Multimode fibres do not have modal dispersion and hence could support higher data rates.

5) Wireless media in the GHz frequency range are typically characterised by

(a) unpredictable attenuation due to atmospheric effects.
(b) a relatively short range of communication compared with wireless media at longer wavelengths, for any given transmit power.
(c) being subject to less electro-magnetic interference than copper cables.
(d) line of sight or reflected communication property.
(e) its ability to support higher data rates.

6) Which of the following statements is/are true with regard to a 6000 bits/sec binary signal encoded by some number of bits/sample?

(a) To achieve a baud rate of 2000, the binary signal should be encoded with 3 bit/sample.
(b) The higher the number of bit/sample encoded, the higher the required bandwidth to transmit the original signal.
(c) An upper limit on the number of bit/sample encoding is determined by the signal to noise ratio of the channel.
(d) To transmit the binary signal with 1 bit/sample encoding, one would require a bandwidth of about 9000Hz.
(e) The higher the number of bits/sample encoded, the lower the required bandwidth to transmit the original signal.

7) It was observed that a certain channel was only able to support a data rate lower than the Shannon's limit. Which of the following could be (a) possible reason(s)?

(a) Attenuation effects	(b) Non Gaussian noise
(c) Delay distortions	(d) Wireless medium
(e) Number of users sharing the channel	

8) Which of the following statements is/are true about error detection techniques used on communications links?

(a) Cyclic Redundancy Check (CRC) sequences can detect as well as correct errors.
(b) Error detection cannot be used on simplex links.
(c) Error detection cannot be used on half duplex links.
(d) Parity check sequences can detect errors but cannot correct the errors.
(e) Hamming code can detect up to 3 bit errors.

9) Reserving bandwidth along a virtual or real circuit

(a) guarantees delay bounds for real time traffic.
(b) is not necessarily needed for data traffic.
(c) will not help in the recovery from data errors.
(d) will help in the recovery from data errors.
(e) is not necessarily needed for real time traffic.

10) Which of the following statements is/are true with regard to base band ISDN?

(a) It consists of two types of channels: basic rate (2B+1D) and primary rate (30B+1D).
(b) A video conferencing link will typically required two basic rate channels.
(c) Each basic rate channel could carry two uncompressed voice telephony channels.
(d) It operates on the principle of packet switching.
(e) It operates on the principle of circuit switching.

11) Early packet switched data networks such as X25 tend to utilise virtual circuits as opposed to datagrams due to

(a) low protocol complexity of the virtual circuit mode.
(b) higher error rate links requiring hop by hop error correction.
(c) low level of buffer resources at nodes requiring hop by hop flow control.
(d) the need to keep packet headers small, with a short virtual circuit identifier.
(e) low data rate links during early days.

12) Which of the following statements is/are true with regard the to datagram mode of transmission?

(a) It is also known as a "best effort" delivery mode.
(b) It must be complemented by a "guaranteed delivery" mode if error free, sequenced end to end data delivery is required.
(c) It will typically operate on a hop by hop basis.
(d) It does not require the establishment of a connection.
(e) It guards against link failures by alternate path routing.

13) A data source and a receiver are connected by a communications link with a bandwidth of 8Mbps, and a round trip propagation delay of 300ms. Assuming that the full bandwidth is available for the source and the receiver is employing an end to end flow control protocol, and that the packet length is 3K bytes, which of the following statements is/are true?

(a) A stop and wait protocol will utilise even less than 50Kbps of bandwidth.
(b) A stop and wait protocol will utilise only 1% of the available bandwidth.
(c) A sliding window protocol when operating will have 100 packets occupying the link.
(d) A sliding window protocol when operating will have 800 packets occupying the link.
(e) A sliding window protocol will utilise the link bandwidth more efficiently than a stop and wait protocol.

14) In which of the following instances would statistical multiplexing be better than time division multiplexing?

(a) For combining sources with probabilistic data traffic
(b) For combining sources with deterministic real time traffic
(c) For packet switched data networks
(d) For circuit switched data networks
(e) When periodic synchronisation between source and receiver is difficult to be achieved

15) Which of the following statements is/are true about flow control?

(a) It attempts to prevent overrun of receiver buffer resources.
(b) It attempts to utilise the link bandwidth to the maximum.
(c) It is sufficient to prevent congestion in the event of many receivers and senders sharing a node.
(d) Sliding window flow control cannot be utilised on half duplex links.
(e) Sliding window flow control cannot be utilised on full duplex links.

16) Which of the following indicates an error if odd part bit scheme is used?

(a) 10101011	(b) 10010011	(c) 10100011
(d) 00110111	(e) 10111101	

17) Consider the following statements.

(i) Cyclic Redundancy Check polynomials are most suitable for burst error detection and correction.
(ii) Hamming codes are a class of efficiently implementable 1-bit error correcting codes.
(iii) Data fields in a frame corresponding to each protocol layer will have its own error check sequence.

Which of them is/are true?

(a) (i) only	(b) (ii) only	(c) (iii) only
(d) (ii) and (iii) only	(e) all	

18) A data source emits 4 symbols x_1, x_2, x_3 and x_4 at random, with associated probabilities of 0.4, 0.3, 0.2 and 0.1 respectively. Which of the following statements is/are true with regard to Huffman coding of the symbols?

(a) x_1=0, x_2=11, x_3=101, x_4=100 is a possible code.
(b) x_1=1, x_2=00, x_3=010, x_4=011 is a possible code.
(c) The average bit length of the Huffman code is 2.
(d) The average bit length of the Huffman code is 1.9.
(e) Huffman code saves 0.1 bits per symbol compared with the conventional binary code.

19) Which of the following statements is/are true with regard to public key cryptography?

(a) Each participating entity will have two keys: the public key and the private key.
(b) The complexity of the underlying algorithm is based on the difficulty of factorising large prime products.
(c) The complexity of the underlying algorithm is based on the difficulty of solving linear equations modulo 2.
(d) Software encryption and decryption using public key cryptography is faster than that using secret key (shared) cryptography.
(e) Public key cryptography solves the so called "key transportation problem" of secret key cryptography.

20) Which of the following statements is/are true about personal area networks (PANs) and local area networks (LANs)?

(a) PANs are wireless only whereas LANs could be wired or wireless.
(b) Bluetooth and Zigbee are famous PANs.
(c) PANs cover a distance of a few meters whereas LANs could cover a distance of hundreds of meters.
(d) PANs can support data rates far exceeding those that LANs can support.
(e) PANs are wired networks whereas LANs could be wired or wireless.

21) Which of the following devices could **not** be a part of a wired LAN based on star topology?

(a) Switch (b) Repeater (c) Hub
(d) Router (e) Base Station

22) The correct order of corresponding OSI layers for having functionalities of routing and reconciling machine representation differences with shared access resolution and ASCII text protocols is

(a) network, physical, transport, data link.
(b) network , physical, data link, application.
(c) network , presentation, data link, application.
(d) network , presentation, physical, transport.
(e) network , physical, data link, transport.

23) Which of the following is **not** a function of the IP layer of an internet protocol stack either at an intermediate node or at an end host?

(a) Re-assembling IP fragments together
(b) Discarding timed-out IP packets
(c) Changing the source IP address and destination IP address between intermediate nodes
(d) Forwarding along the shortest path with reference to a routing table
(e) Encapsulating IP packets in HDLC frames

24) Which of the following is a/are function(s) of the TCP layer of the internet protocol stack?

(a) Directing the packet flow to the correct applications process port
(b) Connection establishment and release between source and destination end points
(c) Guaranteeing a fixed data rate between source and destination end points
(d) In-sequence delivery of packets at the receiving end points.
(e) Error recovery and flow control

25) Both error recovery and flow control on a link would not be advisable if

(a) client- sever interactions are of request/response type short messages.
(b) traffic is of voice/video type.
(c) propagation delays of links are very large.
(d) 'propagation delay-bandwidth' products of links are very large.
(e) links are half duplex.

26) Which of the following is/are true with regard to UDP?

(a) UDP does not define application process port numbers.
(b) UDP cannot do error recovery.
(c) UDP is recommended as the transport protocol for real time traffic.
(d) UDP is recommended as the transport protocol for request-response type traffic.
(e) UDP cannot establish or release connections between source and destination end points.

27) Which of the following is/are true with regard to IP routing?

(a) Routing tables show the mapping of a destination subnet to the next hop router address.
(b) Routing tables show the mapping of a destination subnet to the destination router address.
(c) Routing tables are dynamically updated to reflect network topology changes.
(d) Each router is able to calculate the shortest path from itself to all other destination routers based on information received from its neighbours.
(e) Each router is able to calculate the shortest path from itself to all other destination hosts based on information received from its neighbours.

28) Which of the following statements is/are true with regard to the "Ping" command?

(a) 'Ping' stands for Packet Internet Generator.
(b) Ping activates the ICMP protocol of the IP layer.
(c) The Ping command checks the port level connectivity between source and destination end points.
(d) Ping summarises the packet loss and round trip delay between two IP end points.
(e) Ping activates the RARP protocol of the IP layer.

29) A packet travelling between two intermediate IP routers A and B, on an Ethernet Intranet will have as its address contents

(a) Source IP – originating host, destination IP – destination host, source physical – router A, destination physical – router B.
(b) Source IP – originating host, destination IP – router B, source physical – router A, destination physical – router B.
(c) Source IP – router A, destination IP – router B, source physical – router A, destination physical – router B.
(d) Source IP – originating host, destination IP – router B, source physical – originating host, destination physical – router B.
(e) Source IP – originating host, destination IP – destination host, source physical – originating host, destination physical – destination host.

30) Which of the following is/are true with regard to typical Internet Application protocols?

(a) SMTP, POP and HTTP dialogues can be emulated by telnetting to the relevant application ports and following the standard commands.
(b) SMTP, POP and HTTP are 'ascii-text' protocols as opposed to binary coded protocols.
(c) A single FTP session requires two pairs of port interactions, one for data and the other for control.
(d) TFTP, being a lightweight version of FT, runs on UDP and is used by network applications such as NFS (Network File Service) of Unix.
(e) RTP runs on UDP and is used by real time applications such as voice and video.

31) The advantage(s) of having static route configurations over dynamic routes in an IP Intranet is/are to

(a) make the system administrator's task easier and simpler.
(b) minimise routing table sizes.
(c) prevent intruders from introducing new access paths into the system.
(d) eliminate the need to have routing protocols.
(e) have more efficient routing.

33) Which of the following is/are true with regard to IPv4 address classes?

(a) A large number of networks can exist in Class A compared with Class B.
(b) A large number of networks can exist in Class C compared with Class B.
(c) Class D defines multicast groups.
(d) The host address part of an address block can be further subdivided into a sub network and a host part.
(e) The network address part of an address block can be further subdivided into a sub network and a host part.

34) Which of the following statements is/are true with regard to multi-access resolution protocols as used in LANs?

(a) Probabilistic multi-access protocols such as CSMA/CD are more efficient than deterministic multi-access protocols like Token Passing under heavy loads.
(b) Token Passing protocols can guarantee delay bounds for time sensitive traffic unlike CSMA/CD under all load conditions.
(c) The relatively new concept of fast switching has removed the deficiencies inherent in shared media multi-access protocols.
(d) Probabilistic multi-access protocols such as CSMA/CD are less efficient than deterministic multi-access protocols like Token Passing under heavy loads.
(e) Under all load conditions, CSMA/CD can guarantee delay bounds for time sensitive traffic unlike Token Passing.

35) Which of the following statements about CSMA/CD protocol as specified by the IEEE 802.3 standard is/are true?

(a) It is equally applicable to shared Ethernet as well as switched Ethernet.
(b) The minimum packet transmit time must be at least one round trip propagation delay.
(c) Performance worsens when the propagation delay becomes larger with respect to packet transmit time.
(d) Performance worsens when packet transmit time becomes larger with respect to propagation delay.
(e) Keeping all other parameters constant, the data rate when increased from 10Mbps to 100Mbps makes the network more efficient.

36) Which of the following statements about LAN wiring is/are true?

(a) A UTP Cat5e cabling system can support up to 10Gbps data rates.
(b) Fibre optics cables have superior isolation properties in terms of electromagnetic interference as opposed to UTP cables.
(c) Fibre optic cables can span distances of the order of thousands of meters as opposed to copper cables which may go only up to a few hundreds of meters.
(d) Fibre cables are recommended for intra-building LAN cabling whereas UTP cables are not recommended for such applications.
(e) UTP cabling requires a greater skill in installation than that for fibre optic cable.

37) Which of the following statements is/are true with regard to IEEE 802.11 wireless LANs?

(a) Typically, each wireless cell consists of a hub (or base station) along with a number of hosts interacting with the base station.
(b) Data rates supported by the hub decreases in concentric circles with the highest rate near the hub.
(c) Data rates supported by the hub increases in concentric circles with the lowest rate near the hub.
(d) A specification defines two modes for multi-access: CSMA/CD and polling which occur alternatively in time.
(e) Polled access is recommended for real time traffic needs.

38) The IP network 185.243.0.0 has to be divided into 27 subnets. Which of the following subnet masks correspond to this requirement?

(a) 255.252.0.0
(b) 255.255.192.0
(c) 255.255.248.0
(d) 255.248.0.0
(e) 255.255.252.0

39) In which of the following situations would IP multicasting be found useful?

(a) Updating replicated data copies in a distributed database
(b) Group communications applications
(c) Tunnelling IPv6 packets through an IPv4 intranet
(d) Establishing TCP/IP sessions over VSAT links
(e) Multiparty voice/video conferencing applications

40) Which of the following is/are **not** a valid statement(s) with regard to ensuring QoS over IP networks?

(a) QoS is inherently guaranteed in IP networks since the network provides end to end flow and error control.
(b) Reserving bandwidth across routers using a protocol such as RSVP can guarantee QoS in a homogeneous network.
(c) Tagging each IP packet with a priority class identification and servicing them appropriately at routers can ensure QoS in a heterogeneous network.
(d) Admission control and rate policing is necessary to ensure compliance with service level agreements (SLA).
(e) Application protocols such as RTP can complement any QoS mechanisms provided at the IP level.

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