



UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (*EXTERNAL*)

Academic Year 2005/2006 – 2nd Year Examination – Semester 4

IT4102 – Data Communications and Networks

PART 1 - Multiple Choice Question Paper

5th August, 2006

(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) Using one bit odd parity approach, determine which of the following encoded words is/are detected as having no errors.
- | | | |
|--------------|--------------|--------------|
| (a) 10101010 | (b) 01001010 | (c) 11101010 |
| (d) 10010010 | (e) 10010101 | |
- 2) Consider the following statements.
- (i) TDM requires the transmitter and the receiver to be synchronized periodically.
 - (ii) TDM requires a header field in each packet to identify the destination in the absence of synchronization.
 - (iii) Statistical TDM systems require store and forward buffers to regulate uneven packet flows.
- Which of the above statements is/are true with regard to Time Division Multiplexing (TDM) and its variants?
- | | | |
|-------------------------|--------------------------|------------------------|
| (a) (i) only | (b) (i) and (ii) only | (c) (i) and (iii) only |
| (d) (ii) and (iii) only | (e) (i), (ii) and (iii). | |
- 3) Which of the following specifies the characteristics of a virtual circuit (VC)?
- | |
|---|
| (a) Packets of the same session will follow the same physical route. |
| (b) Each packet should contain a virtual circuit identifier such as an end point port number. |
| (c) There can be a delay involved in establishing the circuit. |
| (d) It can be of two types – end to end VCs and hop – by – hop VCs. |
| (e) They are associated with packetised data transmissions only. |
- 4) In a sub netted class B type IPV4 address block, a possible ratio for the number of usable networks to usable number of hosts per network is
- | | | |
|--------------|--------------|--------------|
| (a) 64:1024 | (b) 64: 1022 | (c) 14: 4094 |
| (d) 254: 254 | (e) 254: 256 | |
- 5) In the CSMA/CD (IEEE 802.3) protocol, which of the following actions will be taken when a frame collision has been detected by a host?
- | |
|---|
| (a) A maximum number of 15 attempts will be made by the sending host(s) on retransmissions. |
| (b) The sending host(s) will differ for a time period proportional to a binary exponential of the number of collisions, before attempting retransmission. |
| (c) Random attempts will be made to transmit the frame. |
| (d) A jamming signal will be issued by all hosts detecting a collision |
| (e) The sending host(s) will differ for a time period linearly proportional to the number of collisions before attempting retransmission. |
- 6) In an IP router configuration the “default route” refers to
- | |
|---|
| (a) a missing response from a neighbour router to a HELLO message request. |
| (b) an error message caused by incorrect routing. |
| (c) a designated gateway for all subnets other than those mentioned in the routing table. |
| (d) a route entry which is statically configured. |
| (e) a datagram that has no specified destination address. |
- 7) The IP network 192.168.50.0 is to be divided into 12 equal sized subnets. Which of the following subnet masks corresponds to this requirement?
- | | | |
|---------------------|---------------------|---------------------|
| (a) 255.255.255.0 | (b) 255.255.255.224 | (c) 255.255.255.240 |
| (d) 255.255.255.248 | (e) 255.255.255.255 | |

- 8) Which of the following statements is/ are true with regard to a unit amplitude rectangular pulse of duration τ , with a period T ?
- | |
|---|
| (a) $\tau \rightarrow 0$ and $T \rightarrow \infty$ is a possibility. |
| (b) Frequency spectrum of the pulse will have components spaced at $1/\tau$ intervals. |
| (c) Frequency spectrum of the pulse will have components spaced at $1/T$ intervals. |
| (d) If $\tau \rightarrow 0$, then all frequency components will be of zero amplitude. |
| (e) For $\tau = T/2$, the frequency spectrum would be equivalent to that of a symmetric square wave. |
- 9) Consider the following statements.
- Wireless media in the GHz frequency range are typically characterized by
- (i) unpredictable attenuation due to molecular absorption effects.
 - (ii) frequency reusability in physical space.
 - (iii) communication based on scattering and reflection of electromagnetic signals
- Which of the above statements is/are true?
- | | | |
|------------------------|-------------------------|---------------|
| (a) (i) and (ii) only | (b) (ii) and (iii) only | (c) (ii) only |
| (d) (i) and (iii) only | (e) (i), (ii) and (iii) | |
- 10) Consider the following statements.
- (i) Hamming codes can only correct 1-bit errors.
 - (ii) Communications over wireless media may cause more burst errors than isolated bit errors.
 - (iii) If only error detection is available, at least half duplex links are required.
- Which of the following statements is/are true about error detection and correction techniques used over communications links?
- | | | |
|-------------------------|-------------------------|----------------|
| (a) (i) only | (b) (i) and (ii) only | (c) (iii) only |
| (d) (ii) and (iii) only | (e) (i), (ii) and (iii) | |
- 11) Which of the following statements is/ are true with regard to the datagram mode of transmission?
- | |
|--|
| (a) Packets will be forwarded to the next hop node on a 'best effort' basis. |
| (b) Datagram mode must be complemented by a "guaranteed delivery" mode for mail and file transfer type applications. |
| (c) Database Request-Response type of short duration applications may use datagrams alone. |
| (d) Voice and Video applications may use datagrams alone. |
| (e) Datagram mode requires the establishment of a connection prior to data transfer. |
- 12) Which of the following statements is/ true about flow control in packet switched networks?
- | |
|--|
| (a) Flow control attempts to prevent overrun of receiver buffer resources. |
| (b) Voice and Video traffic cannot be effectively flow controlled. |
| (c) Sliding window flow control maximizes the link bandwidth utilization. |
| (d) Stop and wait flow control maximizes the link bandwidth utilization. |
| (e) Voice and Video traffic can be flow controlled. |
- 13) A data source emits 4 ASCII characters A T C and G at random, with associated probabilities of 0.4, 0.1, 0.2 and 0.3 respectively. Which of the following statements is/ true with regard to Huffman coding of the symbols?
- | |
|--|
| (a) A=0, G=11, C=101, T=100 is a possible code. |
| (b) A=1, G=00, C=010, T=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 5.1 bits per symbol compared to the 7-bit ASCII code. |

- 14) Consider the following statements.
- (i) The complexity of a public key algorithm is based on the difficulty of factorizing large prime products.
 - (ii) Software encryption and decryption using public key cryptography is faster than using secret key cryptography.
 - (iii) Public key cryptography solves the so called 'key transportation problem' of secret key cryptography.
- Which of the above statements is/ true with regard to public key and secret key cryptography techniques?
- | | | |
|----------------|-------------------------|---------------|
| (a) (i) only | (b) (i) and (iii) only | (c) (ii) only |
| (d) (iii) only | (e) (i), (ii) and (iii) | |
- 15) Which of the following device identifications with respect to OSI layering is/are correct?
- | | |
|--------------------------------|-----------------------|
| (a) Switch: Layer 2 or layer 3 | (b) Repeater: Layer 1 |
| (c) Hub: Layer 3 | (d) Router: Layer 2 |
| (e) Router: Layer 3 | |
- 16) The correct order of corresponding OSI layers for having the functionalities of packet prioritization, shared access resolution, end to end flow and error control and socket based inter process communication are
- | | |
|--|---|
| (a) network, physical, transport, data link. | (b) network, data link, transport, application. |
| (c) network, presentation, data link, application. | (d) network, presentation, physical, transport |
| (e) network, data link, presentation, transport. | |
- 17) Which of the following can be considered as function(s) related to the network layer of the internet protocol stack?
- | |
|--|
| (a) priority based marking and servicing of packets in a router |
| (b) discarding timed out packets |
| (c) re writing the source address and the destination address between intermediate routers |
| (d) forwarding the packet to the next hop based on routing table entries |
| (e) encapsulating packets in HDLC frames |
- 18) Which of the following is a/ are function(s) of the UDP layer of the internet protocol stack?
- | |
|--|
| (a) directing the packet flow to the relevant application process port |
| (b) connection establishment and release between source and destination end points |
| (c) guaranteeing a constant data rate between source and destination end points |
| (d) in-sequence delivery of packets at the receiving end points |
| (e) implementing the go-back-N ARQ protocol for error recovery |
- 19) 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 either static or, are dynamically updated by routing protocols. |
| (d) RIP is a routing protocol optimized for intranets. |
| (e) OSPF and BGP are routing protocols optimized for Internet in general. |

20) Consider the following statements.

- (i) SMTP and HTTP dialogues can be emulated over a Telnet connection using ASCII text commands.
- (ii) Sun's Network File System (NFS) is a remote procedure call (RPC) application implemented on UDP.
- (iii) RTP as used by real time applications runs on TCP.

Which of the above is/are true with regard to typical Internet application protocols mentioned?

- | | | |
|----------------|-------------------------|------------------------|
| (a) (i) only | (b) (i) and (ii) only | (c) (i) and (iii) only |
| (d) (iii) only | (e) (i), (ii) and (iii) | |

21) Which of the following is/ are true with regard to IPv4 address sub netting?

- | |
|---|
| (a) In each subnet, the network address and broadcast address are reserved and cannot be used by any host. |
| (b) A class C network can have 6 subnets of 32 hosts each. |
| (c) A class C network can have 6 subnets of 30 hosts each. |
| (d) The host address part of an address block can be further subdivided into a sub network and a host part. |
| (e) 255.255.255.3 is a valid subnet mask. |

22) Which of the following statements is/ are true with regard to multi access resolution protocols over wireless media?

- | |
|--|
| (a) CSMA/CD is an efficient mechanism for base station based networks. |
| (b) CSMA/CA is an efficient mechanism for base station based networks. |
| (c) TDMA is a deterministic access mechanism. |
| (d) CSMA is a deterministic access mechanism. |
| (e) TDMA is preferred over CSMA for wide area coverage. |

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

- | |
|---|
| (a) At low loads, CSMA/ CD is able to carry voice packets with minimum jitter. |
| (b) The minimum packet transmit time must be at least one round trip propagation delay. |
| (c) Performance improves when the propagation delay becomes larger with respect to packet transmit time. |
| (d) Performance improves when packet transmit time becomes larger with respect to propagation delay. |
| (e) With the length of media and the packet length kept constant, the data rate when increased from 10Mbps to 100Mbps makes the network more efficient. |

24) Which of the following is a/ are valid statement(s) with regard to ensuring QoS over IP networks?

- | |
|---|
| (a) QoS is guaranteed in IP networks since the network provides end to end virtual circuits. |
| (b) QoS sensitive applications are always run on UDP. |
| (c) Tagging each IP packet with a priority class identification and servicing them appropriately at routers can ensure QoS. |
| (d) Providing QoS over wireless networks is easier compared to that over wired networks. |
| (e) Application level buffering and playback can assist in compensating for jitter. |

- 25) A 6MHz analogue video signal can be sampled and later reconstructed if it was sampled at a rate of at least (in M samples/sec)
- | | | |
|---------|---------|--------|
| (a) 3. | (b) 6. | (c) 9. |
| (d) 12. | (e) 10. | |
- 26) Consider the following statements.
- (i) Single mode fibres could support higher data rates than multimode fibres because of lower multimodal dispersion of single mode fibres.
 - (ii) Multimode fibres could carry wide band data using wavelength division multiplexing (WDM).
 - (iii) Compared to other media, single bit errors are more likely than multiple bit block errors to occur in fibres.
- Which of the above statements is/are true with regard to fibre optic transmission media?
- | | | |
|------------------------|-------------------------|----------------|
| (a) (i) only | (b) (ii) only | (c) (iii) only |
| (d) (i) and (iii) only | (e) (i), (ii) and (iii) | |
- 27) Consider the following statements on Shannon's theorem on data transmission in noisy channels.
- (i) The theorem can be stated also as: $S/N = 2^{C/W} - 1$, where S/N is the signal to noise ratio, C is the bit rate and W is the bandwidth of the channel.
 - (ii) The theorem is only valid for wired media.
 - (iii) The theorem is only valid under Gaussian (or white noise) assumptions.
- Which of the above is/are true?
- | | | |
|----------------|-------------------------|------------------------|
| (a) (ii) only | (b) (ii) and (iii) only | (c) (i) and (iii) only |
| (d) (iii) only | (e) (i), (ii) and (iii) | |
- 28) Party A wishes to send party B a digitally signed document. Which of the following statements is/are true with regard to the digital signature?
- | |
|---|
| (a) The signature only ensures that the document is tamper proof, i.e., no unintended changes are done by a third party.
(b) The signature only ensures that the document is signed by A.
(c) The signature ensures that the document is both tamper proof and is signed by A.
(d) The digital signature can be implemented by taking the hash of the document and encrypting it with the private key of A and then by public key of B.
(e) The digital signature can be implemented by encrypting the plaintext of the document with the private key of A and then by public key of B. |
|---|
- 29) Which of the following Internet applications could be based on UDP rather than on TCP?
- | | |
|--|------------------------------------|
| (a) voice over IP | (b) SNMP queries to a MIB database |
| (c) unreliable group multicast | (d) reliable group multicast |
| (e) client queries to a financial database | |
- 30) Which of the following statement(s) is/are true about a 10base2 hub based Ethernet compared to a Layer 2 switch based Ethernet?
- | |
|--|
| (a) Each physical port of the Ethernet switch is a separate collision domain.
(b) All physical ports of the Ethernet switch belong to one collision domain.
(c) All ports of the Ethernet hub belong to one broadcast domain.
(d) Each physical port of the Ethernet hub is a separate collision domain.
(e) All physical ports of the Ethernet switch belong to one broadcast domain. |
|--|

- 31) On an Ethernet based Intranet, a host wishes to send a frame to a remote host which is indirectly connected to the source host via one or more routers. Which of the following is/are true with regard to the MAC frame transmitted by the source?

- | |
|--|
| (a) Source host employs ARP to discover the physical address of the remote host, given its IP address. |
| (b) The destination physical address in the frame header corresponds to that of the nearest router's physical address. |
| (c) The destination physical address in the frame header corresponds to that of the remote host's interface. |
| (d) Source host employs RARP to discover the physical address of the remote host, given its IP address. |
| (e) Source host employs ARP to discover the physical address of the nearest router, given its IP address. |

- 32) Consider the following statements.

- (i) At the TCP level, fragments of application layer payload are sequence numbered and delivered at the destination host, in order.
- (ii) At the IP level, transport layer payload is fragmented to fit the MTU of the access network.
- (iii) IP layer fragments which may be dropped during transit will only be detected at the TCP layer.

Which of the above statements is/are true about packet fragmentation?

- | | | |
|-------------------------|-------------------------|-----------------------|
| (a) (i) only | (b) (ii) only | (c) (i) and (ii) only |
| (d) (ii) and (iii) only | (e) (i), (ii) and (iii) | |

- 33) Which of the following statement(s) is/are true about structured cabling?

- | |
|---|
| (a) Structured cabling refers to copper cabling with either UTP or STP standard. |
| (b) For intra-building wiring, fibre cabling is preferred over copper cabling for the fibre cables' ability to carry Giga bit data rates. |
| (c) For data transmission purposes, UTP structured cabling is cost effective compared to STP cabling. |
| (d) For intra-building wiring, fibre cabling is preferred over copper cabling due to the fibre cables' ability to cover longer distances. |
| (e) A UTP Cat 5e cabling system can support up to 10Gbps data rates. |

- 34) Consider the following statements.

- (i) Mail transfer agents (TA) primarily depend on SMTP for sending email.
- (ii) POP is a user agent (UA) protocol for downloading mail.
- (iii) IMAP is a user agent protocol for sending and receiving mail.

Which of the above statements is/are true about IP based E-mail transaction protocols?

- | | | |
|---------------|-------------------------|------------------------|
| (a) (i) only | (b) (i) and (ii) only | (c) (i) and (iii) only |
| (d) (ii) only | (e) (i), (ii) and (iii) | |

- 35) Given that the electromagnetic propagation velocity in free space is 3×10^8 m/s and that in copper is 2×10^8 m/s, what is the ratio of propagation delay in a 60,000 km Satellite to that of a 200 km of the PSTN (Satellite : PSTN)?

- | | | |
|-------------|------------|---------|
| (a) 2000: 1 | (b) 200: 1 | (c) 3:2 |
| (d) 1:200 | (e) 0.67:1 | |

36) Which of the following is/are true with regard to commonly used network utilities?

- (a) *nslookup* is used to obtain a translation from an IP address to the MAC address of a given host.
- (b) *ping* command is based on ICMP and indicates the reachability of a destination host.
- (c) *ifconfig* may be used to check the status of a network interface including its IP address, MAC address, netmask etc..
- (d) *route add* is used to troubleshoot malfunctioning routers.
- (e) *traceroute* command traces all the intermediate routers along the optimal path to the destination while measuring the path delay.

37) Which of the following statements is/are correct about IP multicasting?

- (a) IPv4 uses Class-C addresses for multicasting within a group.
- (b) Multicast groups have to be managed by a protocol such as IGMP.
- (c) DVMRP and PIM are examples of multicast backbone routing protocols.
- (d) Realizing reliable multicasting consumes too many resources.
- (e) Realizing reliable multicasting is easily accomplished using TCP.

38) Consider the following statements.

- (i) The MAC protocol is only designed to work in a base station (i.e., with an access point) environment.
- (ii) In a half duplex wireless channel, though carrier sensing is possible, collision detection is no longer possible.
- (iii) The IEEE 802.11b standard will support data rates of 11Mbps, 5.5Mbps, 2Mbps and 1Mbps at increasing radial distances from a base station.

Which of the above statements is/are true about the IEEE 802.11 wireless LAN standard?

- | | | |
|----------------|-------------------------|-------------------------|
| (a) (i) only | (b) (i) and (iii) only | (c) (ii) and (iii) only |
| (d) (iii) only | (e) (i), (ii) and (iii) | |

39) Which of the following parameters is/are used to specify a certain QoS under a service level agreement (SLA) between a client connection and a service provider?

- | | |
|-----------------------------|--------------------------------|
| (a) bit/burst error rate | (b) committed information rate |
| (c) peak jitter level | (d) maximum burst duration |
| (e) average burst frequency | |

40) Which of the following issues is/are not of concern in the operation of wireless LANs?

- (a) The level of radio interference
- (b) dependency on a centralized base station
- (c) lack of stable encryption and authentication methods
- (d) challenges posed by short range wireless technologies such as Bluetooth
- (e) limited data rates compared to wired networks
