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Paper Code : IT-602

COMPUTER NETWORKING

Time Allotted : 3 Hours | *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) The data link layer provides ..... delivery.

a) host-to-host b) port-to-port

c) process-to-process d) hop-to-hop.

ii) Using '*n*' nodes with duplex mode transmission, the number of links needed for mesh topology is

a) n^2 b) $2*n$

c) $n*(n-1)/2$ d) $n*(n-1)$.

iii) Communication between a computer and a keyboard involves

a) simplex
b) half-duplex
c) duplex
d) automatic.

iv) The hamming distance between 10001001 and 10110001 is

a) 2
b) 3
c) 0
d) 4.

v) A signal with a bit rate of 8000 bps and a baud rate of 1000 baud, the number of bits per signal element required is

a) 2
b) 4
c) 8
d) 32.

vi) The bandwidth of a signal is 5 kHz and the lowest frequency is 52 kHz. What is the highest frequency ?

a) 5 kHz
b) 10 kHz
c) 47 kHz
d) 57 kHz.

vii) Which topology requires a multipoint connection ?

a) Mesh
b) Star
c) Bus
d) Ring.

viii) Maximum size of the data portion of the IPv4 datagram is

a) 65515 bytes
b) 65555 bytes
c) 65535 bytes
d) 65536 bytes.

ix) An IPv4 address in the class *B* category is given by

a) 125.123.123.2
b) 191.23.21.54
c) 192.128.32.56
d) 10.14.12.34.

x) A telephone network is an example of ..... network.

a) Circuit-switched
b) Message-switched
c) Datagram-switched
d) Virtual Circuit-switched.

xi) In which ARQ, if a NAK received, only the specific damaged or lost frame is retransmitted ?

a) stop-and-wait
b) go-back-*n*
c) selective repeat
d) both (a) and (b).

xii) A subnet mask in class *A* has fourteen 1s. How many subnets does it define ?

a) 8
b) 16
c) 32
d) 64.

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. What is peer to peer process ? What is the difference between OSI model and TCP/IP model ? We have a channel with 1 MHz bandwidth. The SNR for this channel is 63. What is the appropriate bit rate and signal level ? 1 + 2 + 2

3. What is the purpose of guard band ? What is the advantage of controlled access over random access ?

4. How is CDMA superior to FDMA ? Given a 10 bit sequence 1010011110 and a divisor of 1011, find the CRC and check your answer. 2 + 3

5. Compare the piconet and a scatternet in Bluetooth communication. A router outside the organization receives a packet with the destination address 190.240.7.91/16. Show how it finds the network address to route the packet. 2 + 3

6. Explain how the CSMA/CA protocol answers this question : "What should be done if the medium is busy ?" What is the maximum and minimum size of TCP header and why ? What are SMTP and SNMP ?

2 + 2 +

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Discuss protocols and standards in brief.

b) Explain the advantages of layered network architecture.

c) Compare between OSI reference model and TCP/IP reference model using appropriate diagram.

d) Derive a formula to find, in a three-stage crossbar switch, the number of cross points L in terms of the number of input lines N, the number second stage switches k and the number of input lines n with respect to each switch in first stage.

(2 + 2) + 3 + 3 + 5

8. a) Given a bit sequence 01001110, encode the binary string using :

i) NRZ-L ii) NRZ-I

iii) RZ iv) Manchester

v) Differential Manchester.

b) Prove that the maximum size of window in selective repeat ARQ is 2^{m-1} where m is the number of bits used for sequence number.

c) Mention the advantages of QAM over ASK or PSK. Discuss 8-QAM constellation technique with two amplitudes and four phases using the necessary diagram.

5 + 5 + 5

9. a) Mention the significance of "Time to line" field in IPv4 datagram header.

b) Calculate the remainder using CRC technique obtained at the sender side by dividing a given polynomial $(x^9 + x^8 + x^6 + x^4 + x^3 + x + 1)$ with generator polynomial $(x^4 + x + 1)$.

c) Compare between Pure ALOHA and Slotted ALOHA in terms of efficiency.

d) An Ethernet MAC sub-layer receives 1510 bytes of data from upper layer. Can the data be encapsulated in one frame ? If not, how many frames are needed ? Calculate the size of data in each frame. 3 + 5 + 4 + 3

10. a) Define IP address. Discuss different classes of IPv4 addresses with block diagram.

b) Compare IPv4 and IPv6 datagram headers.

c) Suppose an organization is given the block 190.100.0.0/16. The organization needs to divide the address into three groups of cutomers -

i) 1st group has 64 customers; each needs 256 addresses.

ii) 2nd group has 128 customers; each needs 128 addresses.

iii) 3rd group has 128 customers; each needs 64 addresses.

Design the sub-blocks and find out how many addresses are still available after these allocations.

(1 + 4) + 4 + 6

11. Write short notes on any *three* of the following : 3 × 5

a) CHAP

b) FTP

c) SMTP

d) DNS

e) Bluetooth.