

Code: A-28 Subject: COMPUTER NETWORKS

Time: 3 Hours Max. Marks: 100

NOTE: There are 11 Questions in all.

Question 1 is compulsory and carries 16 marks. Answer to Q. 1. must be written in the space provided for it in the answer book supplied and nowhere else.

Answer any THREE Questions each from Part I and Part II. Each of these questions carries 14 marks.

Any required data not explicitly given, may be suitably assumed and stated.

Q.1 Choose the correct or best alternative in the following: (2x8)

a. LAN security is described in the following standard.

(A) 802.8 (B) 802.9

(C) 802.10 (D) 802.11

b. If you connect to the internet from your home computer, chances are that you're using

(A) PPP (B) NCP

(C) DAP (D) FTAM

c. The network topology which uses hierarchy of nodes is

(A) Ring. (B) Tree.

(C) Bus. (D) Fully connected

d. The transmission media with maximum error rate is

(A) Coax cable. (B) Infrared waves.

(C) Satellite link. (D) Optical fiber.

e. In X.25 network layer protocol, the data packet normally contains

(A) data plus four octets of header. (B) data plus three octets of header.

(C) data plus two octets of header. (D) data plus one octet of header.

f. ABM in HDLC stands for

(A) Asynchronous Balanced Mode. (B) Asynchronous Balanced Modem.

(C) Asynchronous Bisync Mode. (D) Asynchronous Bus Modem.

g. ATM uses the following multiplexing technique

(A) FDM (B) TDM

(C) WDM (D) Statistical Muxing

h. Gigabit Ethernet uses

(A) 8B10B encoding (B) PCM encoding.

(C) Huffman encoding. (D) Shannon Fano encoding.

PART I

Answer any THREE Questions. Each question carries 14 marks.

Q.2 a. Explain the difference between connectionless unacknowledged service and connectionless

acknowledged service. How do the protocols that provide these services differ? **(4)**

- b. A channel has a bit rate of 20 Kbps. The stop and wait protocol with a frame size of 4500 bits is used. The delay for error detection and sending ack by the receiver is 0.25 seconds because of a fault. Find the maximum efficiency of the channel if the destination is 30000 kms away and the speed of the propagation of the signal is 2.8×10^8 m/s. Find the decrease in efficiency due to the fault. **(6)**
- c. What are sliding window protocols? Explain the flow control scheme for any of the ARQ protocols. **(4)**

Q.3 a. Explain the various layers of TCP/IP Model mentioning the protocols used in each layer. **(4)**

- b. What is congestion? Explain the leaky bucket algorithm to control congestion. Explain how the drawbacks of this are overcome in a token bucket algorithm. **(6)**
- c. A computer on 6 Mbps network is regulated by a token bucket. The token bucket is filled at the rate of 1 Mbps. It is initially filled to capacity with 8 Mbits. How long should the computer take to fill 6 Mbps? **(4)**

Q.4 a. Why are Queuing models important in Computer networks? Explain any one Queuing model you have studied deriving the relevant expressions such as network delay. **(7)**

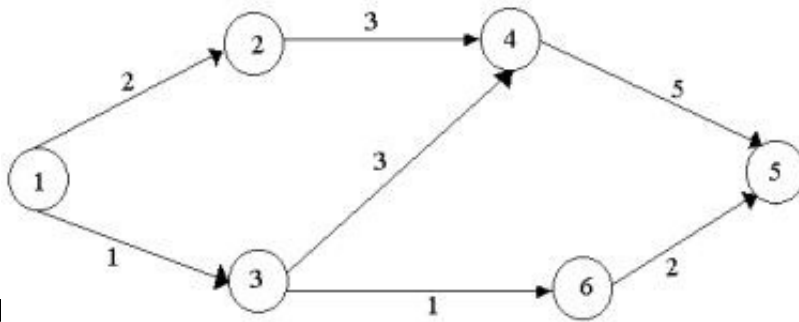
- b. Assume that an M/M/1 queue forms before a railway reservation counter. If people arrive at a mean rate of 10 per hour and each user takes 4 minutes on an average to obtain his ticket, estimate the following:
- (i) Probability that an arriving customer finds the reservation clerk free.
 - (ii) Probability that at least 10 customers are waiting for their turn.
 - (iii) Mean number of customers in the Queuing system.
 - (iv) Average time a customer waits in queue for his turn to come.
 - (v) Probability that there are exactly 5 customers waiting in queue for their turn. **(7)**

Q.5 a. With reference to X.25, explain

- (i) Switched virtual circuit.
- (ii) Permanent virtual circuit.
- (iii) Protocols used at the link level.
- (iv) State diagram to explain call setup and call clearing. **(7)**

b. What are the advantages and limitations of using frame relay over X.25 for communication? What are the various steps in congestion control handling in frame relay networks? **(7)**

Q.6 a. Determine the shortest path from node 1 to node 5 using Bellman-Ford and Dijkstras algorithms, for the network shown in Fig.1 below. **(10)**



b. 1

? (4)

Fig.1

PART II

Answer any **THREE** Questions. Each question carries **14** marks.

Q.7 a. Consider the information bits (1,1,0,1,1,0).

$$g_1(x) = x + 1 \text{ and let } g_2(x) = x^3 + x^2 + 1$$

- Find the codeword corresponding to these information bits if $g_1(x)$ is used as the generating polynomial.
- Find the codeword corresponding to these information bits if $g_2(x)$ is used as the generating polynomial.
- Can $g_2(x)$ detect single errors? Double errors? Triple errors? If not, give an example of an error pattern that cannot be detected. (9)

b. What is statistical multiplexing? Suppose that the traffic that is directed to a statistical multiplexer is controlled so that ρ is always less than 80%. Suppose that packet arrivals are modelled by a Poisson process and that packet lengths are modelled by an exponential distribution. Find the minimum number of packet buffers required to attain a packet loss probability of 10^{-3} or less. (5)

Q.8 a. A slotted ALOHA channel has an average 10% of the slots idle. What is the offered traffic G ? Calculate the throughput and determine whether the channel is overloaded or under loaded? (6)

b. Describe in detail the principle of CSMA/CD and Token ring protocol. (8)

Q.9 a. Consider a videoconferencing application in which the encoder produces a digital stream at a bit rate of 144 kbps. The packetization delay is defined as the delay incurred by the first byte in the packet from the instant it is produced to the instant when the packet is filled. Let P be the information bits and H the header bits.

- Find an expression for the packetization delay for this video application as a function of P .
- Find an expression for the efficiency as a function of P and H . Let $H=5$ and plot the packetization delay and the efficiency versus P . (8)

b. Proponents of ATM argue that VBR connections provide a means of attaining multiplexing gains while providing QoS. Proponents of IP argue that connectionless IP routing can provide much higher multiplexing gains. Can you think of arguments to support each of these claims? Are these claims

conflicting or can they both be correct? **(6)**

Q.10 a. Explain where the following fit in the OSI reference model.

- (i) A 4 kHz analog connection across the telephone network.
- (ii) A 33.6 kbps modem connection across the telephone network.
- (iii) A 64 kbps digital connection across the telephone network. **(6)**

b. Explain briefly any two application layer protocols. **(8)**

Q.11 Write short notes on (any **TWO**) :

- (i) HDLC.
- (ii) Broadband vs. Base band transmission.
- (iii) DQDB
- (iv) ATM
- (v) ISDN interfaces. **(7 x 2 = 14)**

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