

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 2916

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Unique Paper Code : 2342573601

Name of the Paper : Computer Networks

Name of the Course : **B.A. / B.Sc. (Prog)**

Semester : VI

Duration : 3 Hours

Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. **Section A** is compulsory.
3. Attempt **any 4** questions from **Section B**.
4. Parts of a question must be answered together.

Section A

- 1 (a) Write the notion of transmission impairment. Briefly discuss the difference between distortion and attenuation. (1+2=3)
- (b) Consider a noiseless channel with a bandwidth of 4000 Hz that transmits a signal with 8 signal levels. Calculate the maximum bit rate of the channel. (3)
- (c) Identify the OSI layer responsible for each of the following operations: (3)
 - (i) Ensures reliable end-to-end message delivery between processes.
 - (ii) Responsible for moving packets from the source to the destination and enabling internetworking between networks.
 - (iii) Responsible for transmitting raw bits over a physical medium and defining the mechanical and electrical specifications of the interface.
- (d) What are the purposes of the URG, SYN, and PSH flags in a TCP header? (3)
- (e) Why is HTTP a stateless protocol? (3)
- (f) What are the periodic signals, and why are they commonly used in analog transmission? (3)
- (g) What is the full form of DNS? What is its use? (3)

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- (h) What is subnetting? A network on the Internet has a subnet mask of 255.255.240.0. What is the maximum number of hosts it can handle? (1+2=3)
- (i) List different parts of a URL. Give an example. (3)
- (j) Find the class of the following IP addresses. (3)
- (i) 208.34.54.12
 - (ii) 238.34.2.1
 - (iii) 129.14.6.8

Section B

- 2 (a) Consider an extremely noisy channel in which the value of the signal-to-noise ratio is 31. Compute the bit rate if the bandwidth of the channel is 1 kHz. (4)
- (b) If a periodic signal is decomposed into five sine waves with frequencies of 100, 300, 500, 700, and 900 Hz, what is its bandwidth? Draw the spectrum, assuming all components have a maximum amplitude of 10 V. (5)
- (c) Consider a coding scheme with two legal codewords: 01010 and 10101.
- (i) Calculate its Hamming distance. (2)
 - (ii) How many bit errors can be detected by this code? (2)
 - (iii) How many bit errors can be corrected by this code? (2)
- 3 (a) What is the count-to-infinity problem, and why does it occur in the distance vector routing algorithm? (2+2=4)
- (b) Briefly describe the structure of a TCP header. (5)
- (c) A message $M(x)$ 1101101101 is transmitted using the CRC method. The generator polynomial is $x^3 + 1$.
- (i) Compute the transmitted bit string, which includes the message and CRC. (3)
 - (ii) Suppose that the fifth bit from the left is inverted during transmission. Show that this error is detected at the receiver's end. (3)

- 4 (a) Give three differences between connectionless and connection-oriented services in networking. (3)
- (b) What is the HDLC protocol? Explain I-Frame, S-Frame and U-Frame. (2+3=5)
- (c) Consider a network comprising five routers labelled as A, B, C, D, and E. The interconnection and its associated costs are as follows:
- Link between A and B: Cost 2
 - Link between A and C: Cost 4
 - Link between B and C: Cost 1
 - Link between B and D: Cost 5
 - Link between C and D: Cost 3
 - Link between C and E: Cost 7
 - Link between D and E: Cost 2
- Using the Shortest Path Algorithm (Dijkstra's algorithm), illustrate the step-by-step process of determining the shortest path from router A to router E. (7)
- 5 (a) What does the following address mean, and when are they used? (3)
- (i) 0.0.0.0
 - (ii) 127.xx.yy.zz
 - (iii) 156.76.255.255
- (b) What do you mean by CSMA/CD protocol? Discuss the binary exponential back-off algorithm. (2+4=6)
- (c) For Class A, Class B, and Class C IP addresses, specify their address ranges and default subnet masks. (6)
- 6 (a) What is the role of the HTTP protocol in data communication? (3)
- (b) Write the purpose of using Guard Bands in a multiplexed channel, and explain with a suitable example. (2+2=4)
- (c) Describe the structure of an IPv4 address. Why is the IPv6 address structure better than IPv4? (5+3=8)

- 7 (a) What is wavelength division multiplexing? How does it differ from the time division multiplexing technique? (2+3=5)
- (b) Write short notes on the following terms: (2*5=10)
- (i) Switch
 - (ii) Router
 - (iii) HDLC
 - (iv) SMTP
 - (v) ICMP