## COMPUTER NETWORKS (INFO 3201)

**Time Allotted : 3 hrs** 

Full Marks: 70

 $10 \times 1 = 10$ 

Figures out of the right margin indicate full marks.

## Candidates are required to answer Group A and <u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> from each group.

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

## Group – A (Multiple Choice Type Questions)

- 1. Choose the correct alternative for the following:
  - (i) In an IP-over-Ethernet network, a machine X wishes to find the MAC address Y in its subnet, which one of the following technique can be used for this?
    - (a) X sends an ARP request packet to the local gateway's IP address which then finds the MAC address of Y and sends to X
    - (b) X sends an ARP request packet to the local gateway's MAC address which then finds the MAC address of Y and sends to X
    - (c) X sends an ARP request packet with broadcast MAC address in its local subnet
    - (d) X sends an ARP request packet with broadcast IP address in its local subnet.
  - (ii) 802.11 wireless networking uses \_\_\_\_\_ method as the media access method?
     (a) CSMA/CD (b) CTS/RTS (c) CSMA/CA (d) None of these
  - (iii) In a Go-Back-N ARQ, if the window size is 63, what is the range of sequence numbers? (a) 0 - 63 (b) 0 - 64 (c) 1 - 63 (d) 1 - 64.
  - (iv) The process-to-process delivery of the entire message is the responsibility of the \_\_\_\_\_ layer.
     (a) network (b) transport (c) application (d) physical
  - (v) The network layer concerns with
     (a) bits
     (b) frames
     (c) packets
     (d) none of the mentioned.
  - (vi) In classful addressing for class A, how many valid maximum possible network ids can exist?
    (a) 129 (b) 128 (c) 126 (d) 127.
  - (vii) TCP is a \_\_\_\_\_ transport protocol.
    (a) unreliable
    (b) best-effort delivery
    (c) reliable
    (d) none of these

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	(viii)	"Parity bits" are used f (a) Encryption of data (c) To detect errors	owing purposes? (b) To transmit faster (d) To identify the user.						
	(ix)	For a sliding window of but unacknowledged.	of size n-1, there can	be maximur	n of	$\underline{\qquad}$ frames sent			
		(a) 0 (b) 1	11 – 1		(t	1) 11 + 1			
	(x)	<ul><li>(x) What is the major factor that makes coaxial cable less susceptible to no twisted-pair cable?</li></ul>							
		(a) Inner conductor (c) Outer conductor		(d) Insulating material.					
Group- B									
	(a)	) Encode the bit stream 01001100011 using (i) RZ (ii) NRZ (iii) Manchester (iv) Differential Manchester.							
	(b)	Differentiate between	ASK, FSK and PSK.		[(CO2)(Apply/IOCQ)] [(CO2)(Analyze/IOCQ)] 6 + 6 = 12				

3. (a) Explain in detail about various types of multiplexing with diagram.

[(CO2)(Analyze/IOCQ)]

- (b) What is the purpose of cladding in an optical fiber? Compare between omnidirectional waves and unidirectional waves. [(CO2)(Apply/IOCQ)]
   (c) What is a set of the set of
- (c) What is quantization? [(CO2)(Remember/LOCQ)]6 + 4 + 2 = 12

## Group - C

4. (a) Explain the process of collision detection in CSMA/CD with the help of a diagram. Justify the use of jamming signal in CSMA/CD.

[(CO3)(Understand/LOCQ)]

- (b) Define the role of a monitor station in token ring. How a monitor station is chosen when a token ring is initially established? [(CO3)(Remember/LOCQ)]
- (c) How does a monitor station help in token ring maintenance?
  - [(CO3)(Understand/LOCQ)] (3 + 1) + (2 + 2) + 4 = 12
- 5. (a) A pure ALOHA network transmits 200-bit frames on a shared channel of 200 kbps. What is the troughput if the system (all stations together) produces 1000 frames per second? Determine the throughput if the above system produces 1000 frames per second and uses slotted ALOHA protocol.

[(CO3)(Apply/IOCQ)]

(b) Generate CRC code for the data word of 110010101. The divisor is 10101. [(CO3)(Apply/IOCQ)]

2.

- (c) What do you understand by piggybacking in sliding window protocols?
- [(CO3)(Remember/IOCQ)] (2 + 2) + 6 + 2 = 12

## Group - D

- 6. (a) A block of addresses is granted to a small organization. One of the addresses is 205.16.37.39/28.
  - (i) What is the first address in the block?
  - (ii) What is the last address in the block?
  - (iii) Find the total number of addresses in the block. [(CO4)(Analyze/IOCQ)]
  - (b) Write the IP address 135.1.1.25 mask 255.255.248.0 in CIDR notation.
  - (c) Demonstrate with example the benefit of using VLSM.
- 7. (a) "Every host-bit we borrow can double the number of subnets" Criticize with example. [(CO4)(Analyze/IOCQ)]
  - (b) Subnet the Class C IP Address 195.1.1.0 so that you have at least 2 subnets each subnet must have room for 48 hosts. Create two possible subnet masks.
    - [(CO4)(Create/HOCQ)]

[(CO4)(Apply/IOCQ)]

[(CO4)(Apply/IOCQ)] (2 + 2 + 2) + 2 + 4 = 12

(c) Discuss different steps of Distance Vector Routing. [(CO4)(Understand/LOCQ)]
 4 + (2 + 2) + 4 = 12

# Group – E

- 8. (a) For a host machine that uses the token bucket algorithm for congestion control, the token bucket has a capacity of 1 megabyte and the maximum output rate is 20 megabytes per second. Tokens arrive at a rate to sustain output at a rate of 10 megabytes per second. The token bucket is currently full and the machine needs to send 12 megabytes of data. Calculate the minimum time required to transmit the data. [(CO5)(Evaluate/HOCQ)]
  - (b) Argue on the need for using different types of addresses in (i) data link layer, (ii) network layer and (iii) transport layer. [(CO5)(Evaluate/HOCQ)]
  - (c) Write a brief note on HyperText Transfer Protocol.

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[(CO6)(Create/HOCQ)]
6 + 2 + 4 = 12
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- 9. (a) Consider a long-lived TCP session with an end-to-end bandwidth of 1Gbps (=10<sup>9</sup> bits-per second). The session starts with a sequence number of 1234. What is the minimum time (in seconds, rounded to the closest integer) before this sequence number can be used again? [(CO5)(Evaluate/HOCQ)]
  - (b) Evaluate with diagram the working principle of any open loop congestion control algorithm. [(CO5)(Evaluate/HOCQ)]
  - (c) Argue on the need for two different emailing services like SMTP and POP3.

[(CO6)(Create/HOCQ)]

4 + 4 + 4 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	18.75	52.08	29.17

## **Course Outcome (CO):**

After the completion of the course students will be able to

- CO1: Understand the fundamental concepts of data communication and networking, layered models, protocols, networking devices
- CO2: Understand theoretical basis for data communication, digital and analog transmission, multiplexing, switching, transmission media
- CO3: Illustrate data link layer services, framing, error control, flow control, data link layer protocols and various channel access protocols
- CO4: Examine various routing algorithms, addressing schemes and different network layer protocols
- CO5: Evaluate different Internet transport protocols, techniques for congestion control and QoS provisioning
- CO6: Design network applications using different application layer protocols

\*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question