



# INSTITUTE OF AERONAUTICAL ENGINEERING (Autonomous)

Dundigal, Hyderabad - 500 043

CSE(DATA SCIENCE)

## TUTORIAL QUESTION BANK

Course Title	COMPUTER NETWORKS				
Course Code	AITC06				
Program	B.Tech				
Semester	V	DS			
Course Type	Core				
Regulation	UG-20				
Course Structure	Theory			Practical	
	Lecture	Tutorials	Credits	Laboratory	Credits
	3	1	4	-	-
Course Coordinator	Ms V.Alekhya, Assistant Professor				

### COURSE OBJECTIVES:

The students will try to learn:

I	How computer network hardware and software operate
II	Investigate the fundamental issues driving network design
III	The data transmission through protocols across the network in wired and wireless using routing algorithms.

### COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1	<b>Outline</b> the basic concepts of data communications including the key aspects of networking and their interrelationship, packet, circuit and cell switching as internal and external operations, physical structures, types, models, and internetworking	Understand
CO 2	<b>Classify</b> different types of bit errors and the concept of bit redundancy for error detection and error correction.	Understand
CO 3	<b>Identify</b> the suitable design parameters and algorithms for assuring quality of service and internetworking in various internet protocols	Apply
CO 4	<b>Make use of</b> transport protocols (TCP,UDP) for measuring the network performance	Apply

CO 5	<b>Utilize</b> various protocols (FTP, SMTP, TELNET, EMAIL, WWW) and standards (DNS) used in data communications among network.	Apply
CO 6	<b>Interpret</b> various networking models (OSI, TCP/IP) in terms of design parameters and communication modes.	Understand

### QUESTION BANK:

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<b>MODULE I</b>				
<b>INTRODUCTION</b>				
<b>PART A-PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS</b>				
1.	Assume the difference between circuit switching and packet switching. Assume the link's rate is 2 Mbps and users are generating data at a rate of 100 Kbps when busy. Users are busy only a. What is the maximum number of users that a circuit switching architecture can support simultaneously?	Apply	This would require the learner to understand switching concept Then recall the formula and its parameters. Then assigning correct values for the parameters and solving.	CO 1
2.	With a network with bandwidth of 10 Mbps can pass only an average of 12,000 frames per minute with each frame carrying an average of 10,000 bits. What is the throughput of this network?	Apply	This would require the learner to recall network concepts and illustrate network bandwidth and then identify throughput of this network.	CO 1
3.	Imagine a signal travels through a transmission medium and its power is reduced to half. This means $p_2 = (1/2) p_1$ . Calculate Attenuation	Understand	This would require the learner to recall the signals concept and demonstrate transmission medium and apply the procedure to find out Attenuation	CO 1

4.	Consider a telephone line normally has a bandwidth of 3000 Hz (300 to 3300 Hz) assigned for data communications. The signal-to-noise ratio is usually 3162. Calculate the channel capacity for this channel?	Understand	This would require the learner to recall the bandwidth concept and demonstrate transmission medium and apply the procedure to Find out channel capacity	CO 1
5.	Illustrate for a wavelength in vacuum of 1550 nm, the corresponding frequency is 193.4 THz. for a typical single mode fiber, the velocity of propagation is approximately $v = 2.04 \times 10^8$ . Find out Wavelength of the Fiber optic cable.	Apply	This would require the learner to: recall wavelength in vacuum and corresponding frequency relevant concepts Then find out Wavelength of the Fiber optic cable.	CO 1
6.	Interpret the principle differences between connection-oriented communication and connectionless communication.	Understand	This would require the learner to: recall the concept transmission media	CO 1
7.	How long does it take a packet of length 1,000 bytes to propagate over a link of distance 2,500 km, propagation speed $2.5 \times 10^8$ m/s, and transmission rate 2 Mbps? More generally, how long does it take a packet of length L to propagate over a link of distance d. propagation speeds, and transmission rate R bps? Does this delay depend on packet length? Does this delay depend on transmission rate?	Understand	This would require the learner to: recall the concept of transmission media	CO 1

8.	<p>Suppose Host A wants to send a large file to Host B. The path from Host A to Host B has three links, of rates <math>R_1=500</math> kbps, <math>R_2=2</math> Mbps, and <math>R_3 = 1</math> Mbps. a. Assuming no other traffic in the network, what is the throughput for the file transfer? b. Suppose the file is 4 million bytes. Dividing the file size by the throughput, roughly how long will it take to transfer the file to Host B? c. Repeat (a) and (b), but now with <math>R_2</math> reduced to 100 kbps.</p>	APply	<p>This would require the learner to: recall the concept of data communication model.</p>	CO 1
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9.	<p>.Suppose two hosts, A and B. are separated by 20,000 kilometers and are connected by a direct link of R=5 Mbps. The propagation speed over the link is <math>2.5 \times 10^8</math> meter/sec a. Calculate the bandwidth-delay product, R. b. The bandwidth-delay product is the maximum number of bits that can be in the link at any a given time b. Consider sending a file of 800,000 bits from Host A to Host B. Suppose the file is sent continuously as one large message. What is the maximum number of bits that will be in the link at any given time? c. What is the width (in meters) of a bit in the link? d. Derive a general expression for the width of a bit in terms of the propagation speed s the transmission rate R, and the length of the link m? Discuss.</p>	Understand	This would require the learner to: recall the concept of transmission media	CO 1
10.	<p>Calculate propagation time and transmission time for 2.5 Kbyte message and network bandwidth of 1 GBPS. Distance between two end points are 12000 km and light travels at speed of <math>2.4 \times 10^8</math> m/s.</p>	Apply	This would require the learner to recall the concept of transmission media and apply the procedure to find propagation time and transmission time	CO 1
<b>PART-B LONG ANSWER QUESTIONS</b>				
1.	<p>Define switching and Explain packet switching.</p>	Understand	—	CO 2

2.	Illustrate the differences between the OSI and TCP/IP Reference Models.	Understand	This would require the learner to recall the concept of OSI and TCP/IP model then explain the Differences of OSI and TCP/IP Reference Models.	CO 1
3.	Define computer networks? Describe various types of networks topologies in computer network. Also discuss various advantages and disadvantages of each topology.	Understand	—	CO 1
4.	Summarize the characteristics of Computer Networks	Understand	This would require the learner to recall the basics of Computer Networks	CO 1
5.	Illustrate the differences between baseband transmission and broadband transmission.	Understand	This would require the learner to recall the concept of baseband transmission and broadband transmission and then compare between baseband transmission and broadband transmission.	CO 1
6.	Summarize TCP/IP Model. Explain the functions and protocols and services of each layer. Compare it with OSI Model.	Understand	This would require the learner to recall concept of TCP/IP model, explain functions and protocols and services of each layer then compare to OSI Model	CO 1
7.	With a neat sketch and Explain ISO/OSI reference model.	Understand	This would require the learner to recall concept of ISO/OSI reference model then explain the Layers of the ISO/OSI reference model.	CO 1
8.	Define topology and Explain the various topologies of the network.	Understand	—	CO 1
9.	Discuss and Compare various types of networks.	Understand	This would require the learner to recall concept of computer networks, Then explain the various types of networks.	CO 1

10.	List out and Explain the applications of Computer Networks.	Understand	—	CO 1
11.	Define OSI Model. Explain the functions and protocols and services of each layer.	Understand	—	CO 1
12.	Explain the following:- a) LAN b) MAN c) WAN d) ARPANET	Understand	This would require the learner to recall concept of computer networks then explain the various types of networks (LAN , MAN,WAN and ARPANET)	CO 1
13.	Discuss how OSI and ISO related to each other.	Understand	This would require the learner to recall concept of ISO and OSI reference model then explain the Relation of ISO and OSI reference model.	CO 1
14.	Illustrate some of the factors that determine whether a unification system is a LAN or WAN.	Understand	This would require the learner to recall the concept of factors unification system in a LAN or WAN .then explain the factors that determine whether a unification system is a LAN or WAN.	CO 1
15.	Discuss Shannon Capacity with example	Understand	This would require the learner to recall concepts of data rate of a channel then explain Shannon Capacity with example	CO 1
16.	Discuss Nyquist Bit Rate with example	Understand	This would require the learner to recall the Bit rate and How to calculate the Bit Rate then explain Nyquist Bit Rate with example	CO 1
17.	Define bit rate and explain the factors that effects the bit rate	Understand	—	CO 1

18.	Which characteristics affect the quality of service offered by a network? Justify your answer with proper example	Understand	This would require the learner to recall concepts of data rate of a channel then explain Shannon Capacity with example	CO 1
19.	Discuss briefly about the original ARPANET design	Understand	This would require the learner to recall concepts of internet of history	CO 1
20.	Explain the significance of Switching? What are different switching techniques used in computer networks? Discuss.	Understand	This would require the learner to recall concepts of switching	CO 1
<b>PART-C SHORT ANSWER QUESTIONS</b>				
1.	List two disadvantages of twisted pair cables.	Understand	—	CO 1
2.	Define packet switching.	Understand	—	CO 1
3.	List out the two advantages and the two disadvantages of bus topology in network.	Understand	—	CO 1
4.	Explain Nyquist Bit Rate.	Understand	This would require the learner to recall the bit rate and illustrate How to calculate the Bit Rate	CO 1
5.	List out the two advantages of layering principles in computer networks.	Remember	—	CO 1
6.	Define the role of ARPANET in computer networks.	Understand	—	CO 1
7.	Define between baseband transmission and broadband transmission.	Understand	—	CO 2
8.	Define network.	Remember	—	CO 1
9.	List different types of networks.	Remember	—	CO 1
10.	Illustrate why protocols are needed.	Understand	This would require the learner to recall protocol concepts and explain the need of protocols.	CO 1
11.	List the factors to measure the performance of network.	Remember	—	CO 1



12.	What is meant by topology? Name some popular topologies.	Remember	---	CO 1
13.	Define switching.	Remember	---	CO 1
14.	Define Why standards are needed.	Remember	---	CO 1
15.	Explain the importance about MAN.	Understand	This would require the learner to recall concepts of Networks then explain the importance of MAN.	CO 1
16.	Describe the Noise.	Understand	This would require the learner to recall and outline the concept of Noise	CO 2
17.	Explain a short note on WAN.	Understand	This would require the learner to recall the concepts of Networks then outline about WAN.	CO 1
18.	Define Distortion.	Remember	---	CO 2
19.	Explain briefly internet history.	Understand	This would require the learner to recall the concept of internet history then explain history of internet.	CO 1
20.	List the types of the Transmission mediums.	Understand	---	CO 2
21.	Illustrate the importance of LAN.	Understand	This would require the learner to recall concepts of Networks then explain he importance of LAN.	CO 2
22.	Define Attenuation.	Remember	---	CO 1
23.	Define Shannon Capacity.	Remember	---	CO 1
24.	List out the four basic topologies.	Understand	---	CO 1
25.	List two advantages and disadvantages of computer networks.	Understand	---	CO 1
26.	List out the Layers of the OSI model.	Understand	---	CO 1
27.	List out the layers of the TCP/IP reference model.	Understand	---	CO 1

MODULE II				
DATALINK LAYER				
PART-A PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS				
1.	A user wants to transmit the message 11001001 and protect it from errors using the CRC8 polynomial $x^3 + 1$ . Use polynomial long division to determine the message that should be transmitted	Apply	This would require the learner to recall the concept of CRC. Then understand how to transfer the error free data by applying the XOR and AND operation	CO 2
2.	Illustrate a network with one primary and four secondary stations uses polling. The size of a data frame is 1000 bytes. The size of the poll, ACK and NAK frames are 32 bytes each. Each station has 5 frames to send. How many total bytes are exchanged if there is no limitation on the number of frames a station can send in response to a poll?	Understand	This would require the learner to recall the concepts of polling and frames and then explain the How many total bytes are exchanged if there is no limitation on the number of frames	CO 2
3.	Find CRC for $P = 110011$ and $M = 1100011$	Understand	This would require the learner to recall the concept of CRC. Then understand how to transfer the error free data by applying the XOR and AND operation	CO 2
4.	One hundred stations on a pure ALOHA network share a 1- Mbps channel. If frames are 1000 bits long, find the throughput if each station is sending 10 frames/sec	Apply	Learner to recall the pure ALOHA and then apply & find the throughput of each station	CO 2
5.	Calculate the hamming distance for each of the following code words i. d(10000,01000) ii. d(10101, 10010) iii. d(1111,1111) iv. d(0000,0000)	Understand	Learner to recall the hamming code and then apply & find hamming distance of given code word.	CO 2

6.	. Exclusive-OR (XOR) is one of the most used operations in the calculation of codewords. Apply the exclusive-OR operation on the following pairs of patterns. Interpret the results a.(10001),(10001) b. (11100),(00000) c. (10011),(11111)	Understand	This would require the learner to recall the concept of CRC .Then understand how to transfer the error free data by applying the XOR	CO 2
7.	Assuming even parity, find the parity bit for each of the following data units.a. 1001011 b. 0001100 c. 1000000 d. 1110111	Apply	This would require the learner to recall the concept of CRC .Then understand how to transfer the error free data by applying the XOR	CO 2
8.	Given the dataword 101001111 and the divisor 10111, show the generation of the CRC codeword at the sender site (using binary division).	Understand	This would require the learner to recall the concept of CRC .Then understand how to transfer the error free data by applying the XOR	CO 2
9.	A category of error detecting (and correcting) code, called the Hamming code, is a code in which $d_{min} = 3$ . This code can detect up to two errors (or correct one single error). In this code, the values of n, k, and r are related as Find the number of bits in the dataword and the codewords if r is 3	Apply	Learner to recall the hamming code and then apply &find hamming distance of given code word.	CO 2
10	A slotted ALOHA network transmits 200-bit frames using a shared channel with a 200-kbps bandwidth. Find the throughput if the system (all stations together) produces a. 1000 frames per second. b. 500 frames per second. c. 250 frames per second	Apply	Learner to recall the pure ALOHA and then apply &find the throughput of each station	CO 2

<b>PART-B LONG ANSWER QUESTIONS</b>				
1.	Compare and contrast Go back N and selective Repeat	Understand	This would require the learner to recall, analyze the Data-Link Layer Protocols and flow and error control Then compare Go back N and selective Repeat Protocols.	CO 2
2.	List and briefly discuss the two different basic transmission technologies.	Understand	---	CO 2
3.	What is pure ALOHA and slotted ALOHA. Consider the delay of both at low load. Which one is less? Justify your answer.	Understand	---	CO 2
4.	Summarize the working of carrier sense multiple access protocol	Understand	This would require the learner to recall he concepts of Multiple-access Protocols and Then explain the working of carrier sense multiple access protocol.	CO 2
5.	Explain the back-off time of PURE ALOHA protocol	Understand	This would require the learner to recall the concepts of Random-access protocols and then explain the back- off time of PURE ALOHA protocol	CO 2
6.	Describe in detail the types of bridges.	Understand	---	CO 2
7.	Explain the functions of MAC.	Understand	This would require the learner to recall the concepts of Media Access Control (MAC) and then explain the functions of MAC	CO 2
8.	How performance is improved in CSMA/CD protocol compared to CSMA protocol Explain.	Understand	---	CO 2
9.	How CSMA/CA differs from CSMA/CD. Explain in brief	Understand	---	CO 2
10.	What is the purpose of the timer at the sender site?	Understand	---	CO 2

11.	Summarize Error Control & Flow Control.	Understand	This would require the learner to recall the concepts of Network- Layer, Services, protocols: then explain Error Control & Flow Control services	CO 2
12.	What we need a multiple access protocol when we use the local loop of the telephone company to access the internet? Explain.	Understand	—	CO 2
13.	Explain about ALOHA and CDMA	Understand	This would require the learner to recall the concepts of Media Access Control	CO 2
14	What is the need for bridges? Explain the working of 802.x to 802.y bridges in detail.	Understand	—	CO 2
15.	What is the need of Flow control? Explain the common approaches for flow control in data link layer	Understand	This would require the learner to recall the concepts of pure and slotted ALOHA	CO2
16.	Explain how slotted ALOHA solves the problem of Channel allocation	Understand	This would require the learner to recall the concepts of Media Access Control	CO 2
17.	Compare pure ALOHA and slotted ALOHA. Consider the delay of both at low load. Which one is less? Justify your answer?	Understand	This would require the learner to recall the concept of IP addresses	CO 2
18.	Classify the error detection and correction methods in detail	Understand	This would require the learner to recall the concept of error control	CO 2
19.	Demonstrate the services provided by datalink layer in detail?	Understand	This would require the learner to recall the concept of DLC	CO 2
20.	Classify random access protocols in detail?	Understand	This would require the learner to recall the concept of MAC	CO 2

<b>PART-C SHORT ANSWER QUESTIONS</b>				
1.	Describe redundancy.	Understand	Learner to define Redundancy Check and then describe the concepts of Cyclic Redundancy Check.	CO 2
2.	Define vulnerable period.	Remember	---	CO 2
3.	List out the three categories of multiple access protocols.	Understand	---	CO 2
4.	Define CSMA and CDMA.	Remember	---	CO 2
5.	List out the available error detection methods.	Remember	---	CO 2
6.	What is an exponential back off.	Understand	---	CO 2
7.	What are the responsibilities of data link layer.	Remember	---	CO 2
8.	Explain the different types of errors.	Understand	This would require the learner to recall the concepts of errors then explaining the different types of errors.	CO 2
9.	Define bridge.	Remember	---	CO 2
10.	Explain Hub.	Understand	This would require the learner to recall the concepts of Hub and Switch then explaining Hub.	CO 2
11.	List out the functionalities of router.	Understand	---	CO 2
12.	Define ALOHA.	Remember	---	CO 2
13.	Define checksum.	Remember	---	CO 2
14.	Define VLAN.	Remember	---	CO 2
15.	Explain CRC generator.	Understand	This would require the learner to recall the concepts of detection of a single bit error Then explaining CRC generator.	CO 2
16.	How performance is improved in CSMA/CD protocol compared to CSMA protocol.	Understand	---	CO 2
17.	What is vulnerable time?	Understand	---	CO 2

18.	Distinguish between FDMA and TDMA.	Understand	—	CO 2
19.	Explain CRC.	Understand	—	CO 2
20.	Summarize what are the steps followed in checksum generator.	Understand	This would require the learner to recall the concepts of detection of a single bit error and Then explaining checksum generator steps.	CO 2
21.	Define parameter 'a'. How does it affect the performance of the CSMA?	Remember	—	CO 2

MODULE III				
NETWORK LAYER				
PART A-PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS				
1.	Identify the following MASKS in slash notation (/n). a) 255.0.0.0 b) 255.255.224.0 c) 255.255.255.0 d) 255.255.240.0	Understand	Learner to recall the concept of Subnet Mask and describe address class. Use the address class and find the slash notation. img.png	CO 3
2.	Discuss how the traffic is routed efficiently to improve speed and network performance using subnetting. The address of a class B host is to be split into subnets with a 6-bit subnet number. Calculate the maximum number of subnets and the maximum number of hosts in each subnet?	Understand	—	CO 3
3.	Identify the class of the following IP addresses. a) 237.14.2.1b) 208..35.54.12c) 129.14.6.8 d) 114.34.2.8	Apply	Learner to recall the concept of IPv4 and describe address class. Use the address class and find the class.	CO 3
4.	Design the autonomous system with the following specifications : a) There are 8 networks (N1 toN8) b) There are8routers (R1 toR8) c) N1,N2,N3,N4,N5 and N6 are Ethernet LANs d) N7 and N8 are point to point WANs e) R1 connects N1 andN2 f) R2 connects N1 andN7 R3 connects N2 andN8	Apply	Learner to recall the concept of Network and design the autonomous system.	CO 3



5.	A router with IPV4 address 123.45.21.12 and Ethernet physical address 23:45: BA: 00:67: CD has received a packet for a host destination with IP address 124.10.78.10. Build the entries in the ARP request packet sent by the router. Assume no sub-netting?	Apply	—	CO 3
6.	Define Subnet. Consider a company is granted the site address 201.70.64./16. The company needs six subnets of equal size, accordingly design the subnets.	Apply	Learner to recall the concept of Subnet and describe address class. Use the address class and design the subnets.	CO 3
7.	Consider a host using leaky bucket strategy for traffic shaping. The host sends a burst data at a rate of 15Mbps for first 3 seconds and remains silent for 2 seconds. Then again a burst data at a rate of 6 Mbps is send for next 2 seconds and then the host remains silent for next 2 seconds. Now again the host sends data at rate of 5 Mbps for next 3 seconds. What will be the output data rate of the leaky bucket?	Apply	This would require the learner to recall the concept of traffic shaping. Then explain what is leaky bucket and find the output data rate	CO 3
8.	Design the following IP addresses using binary notation: a. 110.11.5.88 b. 12.74.16.18 c. 201.24.44.32	Apply	This would require the learner to recall the concept of IP Addresses	CO 3
9.	Build the following IP addresses using dotted-decimal notation: a. 01011110 10110000 01110101 00010101 b. 10001001 10001110 11010000 00110001 c. 01010111 10000100 00110111 00001111	Apply	This would require the learner to recall the concept of IP Addresses	CO 3

10.	Identify the class of the following classful IP addresses: a. 130.34.54.12 b. 200.34.2.1 c. 245.34.2.8	Apply	This would require the learner to recall the concept of IP Addresses	CO 3
<b>PART-B LONG ANSWER QUESTIONS</b>				
1.	Classify the static and dynamic routing algorithms? Explain the basic concept of flooding.	Understand	This would require the learner to recall the concept of routing algorithms	CO 3
2.	Summarize is the format of IPv4 header? Describe the significance of each field.	Understand	This would require the learner to recall the concept of IP addresses	CO 3
3.	Demonstrate is the format of IPv6 header? Describe the significance of each field.	Understand	This would require the learner to recall the concept of IP addresses	CO 3
4.	Interpret the packet cost is referred in distance vector and link state routing.	Understand	—	CO 3
5.	Describe the Routing Information protocol and Distance vector routing protocol.	Understand	This would require the learner to recall the concept of Unicast Routing Protocols and Routing Algorithms and then describe the Routing Information protocol and Distance vector routing protocol.	CO 3
6.	Explain Leaky bucket algorithm	Evaluate	This would require the learner to recall the concept of Traffic Shaping or Policing and then explain the Leaky bucket algorithm	CO 3
7.	Classify the Flooding algorithms	Understand	This would require the learner to recall the concept of Flooding and then explain the Flooding algorithms	CO 3
8.	Illustrate the fields of an IPv4 datagram header that participate in fragmentation and reassembly.	Understand	—	CO 3

9.	Demonstrate the link state routing algorithm with an example	Understand	This would require the learner to recall the concept of Unicast Routing and then explain the link state routing algorithm with an example	CO 3
10.	Classify the major difference between Distance Vector Routing and Link state routing. Discuss	Understand	---	CO 3
11.	Classify the various congestion control mechanism in detail	Understand	This would require the learner to recall the concept of congestion control and then explain The various congestion control mechanism in detail	CO 3
12.	Explain Internet Protocol with the neat block diagram of IP header format.	Understand	This would require the learner to recall the concept of Network-Layer Protocols and then draw and explain the neat block diagram of IP header format.	CO 3
13.	Summarize the features of the IPv6 Protocol.	Understand	---	CO 3
14.	Illustrate the IP packet format with neat diagram.	Understand	This would require the learner to recall the concept of IPv6 Protocol and explain the IP packet format with neat diagram.	CO 3
15.	Explain the Traffic Shaping	Understand	This would require the learner to recall the concept of Flow Control To Improve QoS and then explain the Traffic Shaping or Policing	CO 3
16.	Illustrate in detail about non- adaptive algorithms	Understand	This would require the learner to recall the concept of non-adaptive algorithms and then explain the about non-adaptive algorithms	CO 3

17.	Summarize the datagram delivery and forwarding in internet protocol.	Understand	This would require the learner to recall the concept of datagram delivery and forwarding in internet protocol and then explain datagram delivery and forwarding.	CO 3
18.	Build the class of each IP address. Give suitable explanation. i) 227.12.14.87 ii) 193.14.56.22 iii) 14.23.120.8 iv) 252.5.15.111 v) 134.11.78.56 vi) 172.18.58.1	Apply	—	CO 4
19.	Explain about Internet Control Message Protocol.	Understand	This would require the learner to recall the concept of Internet Protocol and explain the Internet Control Message Protocol.	CO 3
20.	Classify two groups of multicast routing protocols.	Understand	This would require the learner to recall the concept of multicast routing protocols and Classify two groups of multicast routing protocols.	CO 3

#### **PART-C SHORT ANSWER QUESTIONS**

1.	Explain quality of service.	Understand	This would require the learner to recall the concept of internetworking issue and then explain the quality of service	CO 3
2.	List the classifications of the adaptive algorithms.	Remember	—	CO 3
3.	List the classifications of the non- adaptive algorithms.	Remember	—	CO 3
4.	Define the keys for understanding the distance vector routing.	Remember	—	CO 3
5.	Define Flooding.	Remember	—	CO 3
6.	What is meant by routing algorithm?	Remember	—	CO 3
7.	Illustrate optimality principle.	Understand	—	CO 3

8.	Define Adaptive routing algorithms.	Remember	—	CO 3
9.	Define Non-Adaptive routing algorithms.	Remember	—	CO 3
10.	What is congestion control?	Remember	—	CO 3
11.	State Traffic shaping.	Remember	—	CO 3
12.	Explain Leaky bucket algorithm.	Understand	This would require the learner to recall the concept of Leaky bucket algorithm and then explain the Leaky bucket algorithm	CO 3
13.	Define Load shedding.	Understand	—	CO 3
14.	What are the design issues of network layer.	Understand	—	CO 3
15.	List network support layers and the user support layers.	Understand	—	CO 3
16.	Explain store and forward.	Understand	This would require the learner to recall the concept of store and forward and then explain store and forward	CO 4
17.	List out the keys for understanding the link state routing.	Remember	—	CO 3
18.	List the requirements of the routing algorithms.	Remember	—	CO 3
19.	List the three variants of the internetworking.	Remember	—	CO 3
20.	Define virtual circuit.	Remember	—	CO 3

MODULE IV				
TRANSPORT LAYER				
PART A- PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS				
1.	Assume An end system sends 50 packets for second using UDP over a full duplex mode 100 Mbps Ethernet LAN Connection. Each packet consists of 1500 Bytes of the Ethernet frame payload data. What is the throughput when measured at UDP protocol?	Apply	This would require the learner to recall the concept of IP. understand the concept of UDP protocol and then find the Packets of UDP over a full duplex mode and then applying the throughput.	CO 5
2.	Assume each packet has typical TCP and IP headers each 20bytes long. If we have three computers, A, B and C. The link between A and B has an MTU of 3000 bytes, while the link between B and C has an MTU of 1000 bytes. Consider the case where a packet needs to be sent from A to C that has a size of 3000 bytes (including headers). How many fragments will we have from B to C, and how much data will be in each fragment (i.e. excluding headers). (all connections are assumed to be Ethernet)	Apply	This would require the learner to recall the concept of IP. understand the concept of TCP and IP headers and find out the How many fragments and then apply how much data will be in each fragment.	CO 5
3.	Design a TCP connection is using a window size of 12000 bytes and the previous acknowledgement remembrance number was 22001.It receives a segment with acknowledgment number 24001 and window size advertisement of 12000. Design a diagram to show the situation of the window before and after.	Apply	This would require the learner to recall the concept of TCP and Then design a diagram to show the situation of the window before and after.	CO 5

4.	Organize a client uses UDP to send data to a server. The data are 15 bytes. Calculate the efficiency of this transmission at the UDP level (ratio of useful bytes to total bytes).	Apply	This would require the learner to recall& relate the concept of UDP and Then apply to Calculate the efficiency of this transmission at the UDP level.	CO 5
5.	The following is a dump of a UDP header in hexadecimal form: 06 32 00 0D 00 1C E2 17 What is the (a) Source port number (b) Destination port number (c) Total length of the UDP (d) Length of the data (e) Considering that an IP frame can have a maximum total length of 65 535 bytes, what is the maximum length of the data in a UDP frame? .	Understand	This would require the learner to recall the concept of UDP	CO 4
6.	A TCP connection is using a window size of 10 000 bytes, and the previous acknowledgment number was 22 001. It receives a segment with acknowledgment number 24 001. Draw a diagram to show the situation of the window before and after. .	Understand	This would require the learner to recall the concept of TCP and Then design a diagram to show the situation of the window before and after.	CO 4

7.	<p>a) The following is a dump (contents) of a UDP header in hexadecimal format. 0045DF0000580000</p> <p>a. What is the source port number?</p> <p>b. What is the destination port number?</p> <p>c. What is the total length of the user datagram?</p> <p>d. What is the length of the data?</p> <p>e. Is the packet directed from a client to a server or vice versa?</p> <p>f. What is the application-layer protocol?</p> <p>g. Has the sender calculated a checksum for this packet?.</p> <p>b) Explain leaky bucket and token bucket algorithms</p>	Understand	This would require the learner to recall the concept of UDP and calculate length of user datagram,length of data and checksum	CO 4
8.	<p>The following is part of a TCP header dump (contents) in hexadecimal format. E293 0017 00000001 00000000 5002 07FF...</p> <p>a. What is the source port number?</p> <p>b. What is the destination port number?</p> <p>c. What is the sequence number?</p> <p>d. What is the acknowledgment number?</p> <p>e. What is the length of the header?</p> <p>f. What is the type of the segment?</p> <p>g. What is the window size?</p>	Apply	This would require the learner to recall the concept of TCP header format .	CO 4
9.	<p>In a TCP connection, the window size fluctuates between 60,000 bytes and 30,000 bytes. If the average RTT is 30 ms, what is the throughput of the connection?</p>	Apply	This would require the learner to recall the concept of TCP and then calculate the throughput	CO 4



10.	Draw and explain each field in the TCP Segment header.	Apply	This would require the learner to recall the concept of TCP and Then design a diagram to show the situation of the window before and after.	CO 4
<b>PART-B LONG ANSWER QUESTIONS</b>				
1.	Explain the real transport protocol of UDP and how will you calculate checksum in UDP.	Understand	This would require the learner to recall the concept of transport protocol of UDP and Then explain real transport protocol of UDP and how will you calculate checksum in UDP	CO 5
2.	Show neatly the TCP segment format and describe each of it.	Understand	—	CO 4
3.	Classify the network performance characteristics.	Understand	—	CO 5
4.	Illustrate the adaptive retransmission policy in detail.	Understand	This would require the learner to recall the concept of adaptive retransmission policy and Then explain adaptive retransmission policy in detail.	CO 4
5.	Show the TCP connection establishment and termination using timeline diagram.	Understand	—	CO 5
6.	Explain the three way handshake protocol to establish the transport level connection.	Understand	—	CO 5
7.	Design TCP state transition diagram and describe each of it.	Understand	This would require the learner to recall the concept of TCP state transition diagram and Then explain Design TCP state transition diagram and describe each of it.	CO 5

8.	Explain a detailed note on connection establishment.	Understand	This would require the learner to recall the concept of connection establishment and then explain detailed note on connection establishment.	CO 5
9.	Discuss about the TCP sliding window algorithm for flow control.	Understand	This would require the learner to recall the concept of TCP sliding window and Then explain TCP sliding window algorithm for flow control.	CO 5
10.	Summarize all congestion control algorithms and describe how it works.	Understand	This would require the learner to recall the concept of congestion control algorithm and Then explain congestion control algorithms and describe how it works	CO 5
11.	Illustrate leaky bucket and token bucket algorithm.	Understand	This would require the learner to recall the concept of leaky bucket and token bucket and Then explain leaky bucket and token bucket algorithm.	CO 5
12.	Compare & Contrast UDP & TCP with suitable example.	Understand	This would require the learner to recall the concept of UDP & TCP and Then explain the differences of UDP & TCP	CO 5
13.	Explain congestion avoidance techniques in detail.	Understand	This would require the learner to recall the concept of congestion avoidance techniques and Then explain the congestion avoidance techniques in detail.	CO 5
14.	Classify major types of networks and give brief note on each of it.	Understand	—	CO 5

15.	Illustrate data units at different layers of the TCP / IP protocol suite.	Understand	This would require the learner to recall the concept of data units and Then explain data units at different layers of the TCP / IP protocol suite.	CO 4
16.	Discuss in detail about the connection establishment and release in TCP.	Understand	This would require the learner to recall the concept of data units and Then explain data units at different layers of the TCP / IP protocol suite.	CO 5
17.	Summarize about TCP sliding window algorithm for flow control. A TCP machine is sending windows of 65535 B over a 1 Gbps channel that has a 10 msec one way delay. i) What is the maximum throughput achievable? ii) What is the line efficiency?	Apply	This would require the learner to recall the concept of data units and Then explain data units at different layers of the TCP / IP protocol suite.	CO 5
18.	Explain leaky bucket and token bucket algorithms.	Apply	This would require the learner to recall the concept of Congestion control Algorithms	CO 4
19.	Summarize in detail about transport layer protocols	Understand	This would require the learner to recall the concept of Transport layer	CO 5
20.	Given a DUMP of a UDP header in hexadecimal format 04 21 00 0B 00 2A E2 17.Find the following: i) Source port number ii) Destination port number iii) Length of user datagram iv) Length of the data	Apply	This would require the learner to recall the concept of UDP	CO 5
<b>PART-C SHORT ANSWER QUESTIONS</b>				
1.	List out the functions of transport layer.	Remember	---	CO 5
2.	Define Multi-protocol router.	Remember	---	CO 5
3.	List out duties of the transport layer.	Remember	---	CO 5

4.	Define role of TCP in networks.	Remember	—	CO 5
5.	Distinguish between network layer delivery and the transport layer delivery.	Understand	This would require the learner to recall the concept of network layer delivery and transport layer delivery Then explain& contrast the Differences of network layer delivery and the transport layer delivery.	CO 5
6.	Classify is the difference between TCP and UDP?	Understand	—	CO 5
7.	Show UDP header format.	Understand	—	CO 5
8.	Explain a short note on transport layer services.	Understand	This would require the learner to recall the concept of transport layer and Then explain the transport layer services.	CO 4
9.	Demonstrate congestion? How to control congestion.	Understand	—	CO 4
10.	Summarize multiplexing.	Understand	—	CO 4
11.	How connection establishment is acquiring in TCP.	Remember	—	CO 5
12.	Explain how to release a connection from the network.	Understand	—	CO 5
13.	Demonstrate Internet Transport Protocols.	Understand	—	CO 5
14.	Show datagram format of UDP.	Understand	This would require the learner to recall the concept of UDP and explain the datagram format of UDP.	CO 5
15.	Distinguish between contention and congestion.	Understand	—	CO 5
16.	Define tunneling.	Remember	—	CO 5
17.	State the four major aspects of reliable delivery at the transport layer.	Understand	—	CO 5
18.	How check sum is calculated in TCP.	Remember	—	CO 4
19.	What is CODE BITS in TCP header?	Remember	—	CO 4

20.	Define the use of SYN and FIN bits in TCP.	Remember	—	CO 5
<b>MODULE V</b>				
<b>APPLICATION LAYER</b>				
<b>PART A-PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)</b>				
1.	Determine which of the following an FQDN is and which is a PQDN. a. Mil b. Edu c. xxx.yyy.net d. iare e.www.iare.ac.in	Apply	This would require the learner to recall the concept of DNS. understand the concept of FQDN and PQDN. Then apply the above concepts find the DNS.	CO 6
2.	Illustrate the TCP connection needed in the FTP.	Understand	This would require the learner to recall the concept of TCP connection and Then explain the TCP connection needed in the FTP.	CO 6
3.	Interpret the following sequences of characters (In Hexadecimals) received by a TELNET client or server. a. FFFB01 c. FFF4 FFFE01 d. FFF9	Understand	This would require the learner to recall the concept of Telnet. Then explain the sequences of characters (In Hexadecimals) received by a TELNET client or server.	CO 6
4.	Build the sequence of bits sent from a client TELNET for the binary transmission of 11110011 00111100 11111111	Apply	This would require the learner to recall& relate the concept of Telnet. Then apply the sequence of bits sent from a client TELNET for the binary transmission	CO 6
5.	Determine which of the following is an FQDN and which is a PQDN? a. mil b. edu c. xxx.yyy.net zzz.yyy.xxx.edu	Understand	This would require the learner to recall the concept of DNS. Summarize the concepts of FQDN and PQDN. Then Analyze and Apply above concepts to find the DNS.	CO 6
6.	a)How Network Security can be achieved explain in detail ? b) Write about electronic mail in detail.	Understand	This would require the learner to recall the concept of E-mail	CO 6

7.	a) Demonstrate DNS and Summarize the resource records are associated with it? Explain. b) Classify the five basic functions supported in e-mail systems? Explain	Understand	This would require the learner to recall the concept of E-mail	CO 6
8.	Demonstrate authentication ?Summarize how the authentication is provided based on shared secret key?	Understand	This would require the learner to recall the concept of E-mail	CO 6
9.	How would you summarize the concepts of E-mail, its architecture and services?	Understand	This would require the learner to recall the concept of E-mail	CO 6
10.	Interpret the role of the local name server and the authoritative name server in DNS.	Understand	This would require the learner to recall the concept of Domain Name System and Then explain the role of the local name server and the authoritative name server in DNS	CO 6
<b>PART-B LONG ANSWER QUESTIONS</b>				
1.	Explain are the duties of FTP protocol?	Understand	---	CO 6
2.	Summarize the two methods of HTTP.	Understand	---	CO 6
3.	Define Big-endian format and little-endian format.	Understand	---	CO 6
4.	Explain the role of the local name server and the authoritative name server in DNS.	Understand	This would require the learner to recall the concept of Domain Name System and Then explain the role of the local name server and the authoritative name server in DNS	CO 6
5.	Define Domain Name Service (DNS) and explain in detail about the domain hierarchy and name servers?	Understand	---	CO 6

6.	Explain in detail about the working principles of Simple Network Management Protocol (SNMP).	Understand	This would require the learner to recall the concept of Simple Network Management Protocol and Then explain the working principles of Simple Network Management Protocol	CO 6
7.	What is HTTP protocol used for? What is the default port number of HTTP protocol?	Understand	—	CO 6
8.	Explain in detail about the World Wide Web.	Understand	This would require the learner to recall the concept of Web and Then explain the World Wide Web.	CO 6
9.	Illustrate the working principle of FTP in detail with neat diagram.	Understand	This would require the learner to recall the concept of FTP and Then explain the working principle of FTP in detail with neat diagram.	CO 6
10.	Compare and contrast between ARP and RARP.	Understand	This would require the learner to recall the concept of ARP and RARP and Then explain the Differences between ARP and RARP.	CO 6
11.	Discuss the specific purposes of the DNS, HTTP application layer protocols.	Understand	This would require the learner to recall the concept of DNS, HTTP application layer protocols and Then explain the purposes of the DNS, HTTP application layer protocols.	CO 6
12.	Compare and contrast client/server with peer-to-peer data transfer over networks.	Understand	This would require the learner to recall the concept of client/server with peer-to-peer data transfer over networks and Then compare client/server with peer-to-peer data transfer over networks	CO 6

13.	What is authentication? Explain how the authentication is provided based on shared secret key?	Understand	This would require the learner to recall the concept of PGP,S/MIME	CO 6
14.	Demonstrate are the five basic functions supported in e-mail systems? Explain.	Understand	This would require the learner to recall the concept of PGP,S/MIME	CO 6
15.	Write about Electronic mail in detail?	Understand	This would require the learner to recall the concept of E-mail	CO 6
16.	Write short notes on the following i) Multi Media ii) SNMP	Understand	This would require the learner to recall the concept of Application layer protocols	CO 6
17.	Write short notes on the following i) PGP	Understand	This would require the learner to recall the concept of Application layer protocols	CO 6
18.	Write short notes on Application layer services	Understand	This would require the learner to recall the concept of Application layer protocols	CO 6
19.	Write short notes on client-server programming	Understand	This would require the learner to recall the concept of Application layer protocols	CO 6
20.	Write short notes on the following i) Telnet ii) HTTP	Understand	This would require the learner to recall the concept of Application layer protocols	CO 6
<b>PART-C SHORT ANSWER QUESTIONS</b>				
1.	Demonstrate the purpose of Domain Name System?	Remember	—	CO 6
2.	List Out advantages of stateless server of HTTP.	Understand	—	CO 6
3.	Summarize message Formatting.	Understand	—	CO 6
4.	Explain the three main division of the domain name space.	Understand	This would require the learner to recall the concept of main division of the domain name space and then explain three main division of the domain name space.	CO 6



5.	Distinguish between FTP & HTTP.	Understand	—	CO 6
6.	Discuss the basic model of FTP.	Understand	This would require the learner to recall the concept of FTP and Then explain the basic model of FTP.	CO 6
7.	Illustrate the need of Uniform Resource Locator in WWW.	Understand	This would require the learner to recall the concept of Uniform Resource Locator and Then explain the need of Uniform Resource Locator in WWW.	CO 6
8.	List two applications of Application Layer	Remember	—	CO 6
9.	Summarize DNS Name Space?	Understand	—	CO 6
10.	List the advantages of Email.	Remember	—	CO 6
11.	Define SNMP.	Remember	—	CO 6
12.	Explain the concept of Telnet.	Understand	This would require the learner to recall the concept of Telnet and Then explain the Telnet	CO 6
13.	Define FTP.	Remember	—	CO 6
14.	Summarize about MIME.	Understand	This would require the learner to recall the concept of Application- Layer Security and Then explain the MIME.	CO 6
15.	Illustrate the use of MIME Extension.	Understand	—	CO 6
16.	Outline a brief history of WWW	Understand	This would require the learner to recall the concept of Internet and Then explain the history of WWW.	CO 6
17.	Define Lossy Compression and Lossless Compression.	Remember	—	CO 6
18.	Write a note on HTTP. Also write its advantage and disadvantage.	Understand	This would require the learner to recall the concept of HTTP protocol.	CO 6
19.	Classify the e-mail program.	Understand	—	CO 6

20.	Summarize mail access protocol.	Understand	This would require the learner to recall the concept of mail access protocol	CO 6
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**HOD CSE(DS)**