

No. of Printed Pages : 4

MCS-218

**MASTER OF COMPUTER
APPLICATIONS (MCA) (NEW)**

Term-End Examination

December, 2021

**MCS-218 : DATA COMMUNICATION AND
COMPUTER NETWORKS**

Time : 3 Hours

Maximum Marks : 100

Note : (i) Question No. 1 is compulsory and carries 40 marks.

(ii) Attempt any **three** questions from the rest.

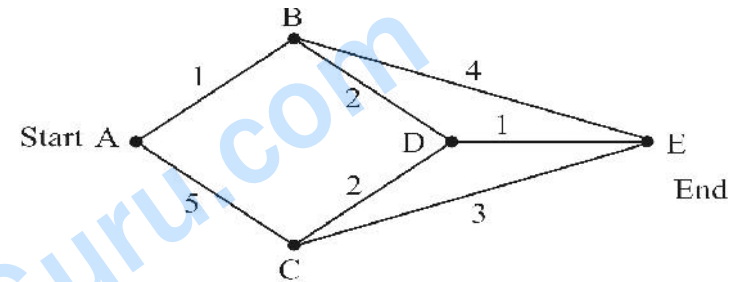
1. (a) Find the CRC for the data polynomial $x^9 + x^7 + x^5 + x^2 + 1$, with the generator polynomial $x^3 + x + 1$. 3
- (b) What is a Local Area Network (LAN) ? What are the typical characteristics of a LAN ? 5

- (c) Write the characteristics of transmission and propagation delays. 4
 - (d) Differentiate between congestion control and flow control. 4
 - (e) Compare layer 2 and layer 3 switches. 5
 - (f) Explain key generation algorithm for RSA. Explain its process with an example. 6
 - (g) Discuss the QAM (Quadrature Amplitude Modulation) technique. Draw 8-QAM constellation diagram. 7
 - (h) Draw IPv4 header structure and explain the significance of flags. 6
2. (a) Which frequency bands are used for AM, FM and Radar bands ? Write the relationship between tower height and distance between repeaters. 5
 - (b) Explain why PAM is a necessary pre-requisite to PCM ? What would be the minimum sampling interval needed for reconstructing a signal with highest frequency of 1 kHz ? 5

- (c) Explain the concept of circuit and packet switching, with a suitable example. 5
- (d) Compare star and tree topology in detail with a suitable diagram. 5
3. (a) What is a Hamming Code ? How many redundant bits are required to identify errors in a character of 7 bits. Also mention the specified positions for inserting these redundant bits. 5
- (b) What is meant by pure ALOHA ? Calculate the throughput of slotted ALOHA protocol. 5
- (c) Discuss IEEE 802.11 protocol in detail with a suitable diagram. 10
4. (a) With reference to connection oriented services, what are the steps in connection establishment and termination ? 5

P. T. O.

- (b) What is Dijkstra's algorithm for shortest path ? Find the best route between points 'A' and 'E' using Dijkstra's algorithm. 10



- (c) What are the classes in IP addressing ? Explain the rules to determine the address class. 5
5. (a) What is Multiplexing ? Show the upward multiplexing with the help of a diagram. 5
- (b) Discuss the contents of a digital certificate. Explain the importance of digital certificate. 5
- (c) Explain the concept of RPC in detail. Draw a diagram to explain RPC. 10

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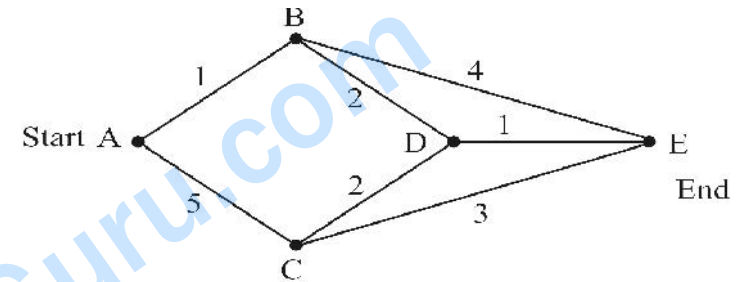
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June, 2022

**MCS-218 : DATA COMMUNICATION AND
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Time : 3 hours

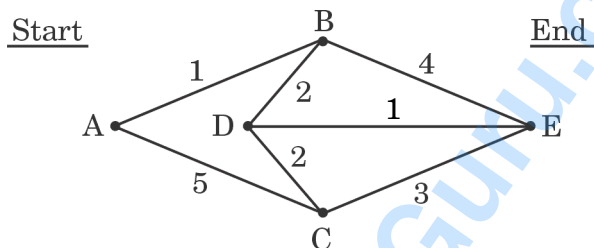
Maximum Marks : 100

Note : Question no. 1 is **compulsory** and carries 40 marks.
Attempt any **three** questions from the rest.

1. (a) What is meant by CRC ? Write the following bitstring in polynomial representation : 4
"1100010"
- (b) What are Wireless LANs ? Discuss the disadvantages of using radio transmitters. 5
- (c) What is Transmission Media ? Compare optical fiber with copper wire. 5
- (d) What is meant by burst error ? How can burst errors be corrected ? 5
- (e) Explain the three types of internetwork addresses with a suitable example for each. 5

- (f) Explain the concept of Diffie-Hellman key generation. Generate public and private key pairs using RSA algorithm using 7 and 11 as two prime numbers. 6
- (g) Differentiate between PSK and FSK modulation techniques. Explain the term “Quantization”. 5
- (h) Draw IPv4 header structure and explain the significance of Fragment offset. 5
- 2.** (a) What is encoding ? Explain digital-to-digital encoding with an example. 5
- (b) Explain the characteristics of Wide Area Network (WAN). Differentiate between client-server and peer-to-peer architecture. 10
- (c) Discuss the importance of multiplexing. List the basic multiplexing techniques. 5
- 3.** (a) What is checksum ? Explain the features of sliding window protocol. 5
- (b) What is pipelining ? Explain stop and wait ARQ when ‘ACK’ is lost, with the help of a diagram. 5
- (c) Briefly discuss the terms CSMA and CSMA/CD. Explain Ethernet frame format IEEE 802.3. 5
- (d) Explain the utility of Spanning Tree and Source Routing Bridges in computer networks. 5

4. (a) What is a MAC address ? Compare virtual circuit and datagram subnets. 5
- (b) Find the shortest route between points 'A' and 'E' in the graph given below : 7



- (c) Explain Token Bucket Traffic Shaper with a suitable diagram. 3
- (d) What is meant by fragmentation ? Compare Interior and Exterior gateway routing protocols. 5
5. (a) Define handshaking protocol. What are the types of services provided by the transport layer ? 5
- (b) What is Nagle's Algorithm ? Explain TCP connection establishment in normal operation. 5
- (c) What is a Feistel network ? Write short notes on Modes of Operation (CBC and OFB). 5
- (d) What is a Virtual Private Network (VPN) ? Write the salient features of X.509 certificates. 5

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Note : (i) *Question No. 1 is compulsory and carries
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rest.*

1. (a) Why bit stuffing is advantageous over character stuffing ? Write the bit sequence after bit stuffing for the data stream "110001111111100001111100". 2+3

P. T. O.

- (b) Differentiate between simplex, half duplex and full duplex modes of data transmission. 5
- (c) What is data encoding ? Explain *three* different ways in which encoding of analog signal with analog information is performed. 2+3
- (d) What is Pipelining ? Explain selective repeat ARQ. 2+3
- (e) Write short notes on hidden station and exposed station problem. 5
- (f) Explain shortest path routing algorithm with a suitable example. 5
- (g) What is remote procedure call ? Mention some important features of UDP. 2+3
- (h) Define a cyber threat. List some common threats in a user's system. 2+3
2. (a) What are synchronous, asynchronous and isochronous communication techniques ? 5

- (b) What is Phase Modulation ? Why is Amplitude Modulation (AM) the most susceptible to noise ? 2+3
- (c) Define multiplexing and switching. What are the differences between ADSL and cable ? 3+2
- (d) What is Internetworking ? Differentiate between star and ring topologies of networking. 2+3
3. (a) Find the CRC for the data polynomial $x^4 + x^2 + x + 1$, where generator polynomial is $x^3 + 1$. 5
- (b) Explain stop and wait ARQ in normal operation and when frame is lost. 5
- (c) What is slotted ALOHA protocol ? Explain its throughput calculation. 5
- (d) Explain 802.11 protocol stack. What are source routing bridges ? 3+2
4. (a) Compute the end to end delay for circuit switching for a network having 5 hops to switch a message of 1200 bits. Here all the

links have a data rate of 4800 bps. Size of packet is 1024 bits with a header of 32 bits. Assume 0.5 sec as a call setup time and hop delay as 0.2 sec and there is no processing delay. 8

- (b) What is distance vector routing ? Explain the count to infinity problem. 3+3
 - (c) Differentiate between congestion control and flow control. Explain congestion control in packet switched networks. 3+3
5. (a) Explain the connectionless and connection oriented services provided by the transport layer. 5
- (b) What are important features of UDP ? Why is it not considered as a reliable service ? 5
 - (c) What is a digital signature algorithm ? Explain the basis of ElGamal public key cryptosystem. 5
 - (d) What is a Firewall ? Explain the working of intrusion detection system. 5

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Note : (i) *Question No. 1 is compulsory and carries 40 marks.*

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1. (a) Given a signal whose amplitude varies from + 6.4 V to – 6.4 V. If we want to quantise it into 64 levels, what would be the quantised values corresponding to signals of – 3.6 V and + 0.88 V ? 5

- (b) What is the minimum and maximum length of the IEEE 802.3 Ethernet frame ? Differentiate between 10 Base 2 and 10 Base T ethernet cables. 1+4
- (c) List and explain policies that can be used to avoid congestion. 1+4
- (d) What is meant by public key cryptography ? Explain RSA key generation with an example. 2+4
- (e) Explain the terms Virus, Worm, Trojan and Malware. 1+1+1+1
- (f) What is noise in a signal ? Explain any *three* types of noise in transmission. 2+3
- (g) What is multiplexing ? Explain synchronous time division multiplexing. 2+3
- (h) Explain Bellman–Ford algorithm with a suitable example. 5
2. (a) Define transmission and propagation delays. Explain the working of fiber optic cable. 2+3

- (b) What is PCM ? Why is PAM a necessary pre-requisite to PCM ? 2+3
- (c) Differentiate between circuit switching and packet switching. 5
- (d) List and explain the functionality of layers in OSI reference model. 5
3. (a) Explain the terms : CRC, Error detection, Checksum, Forward error correction and Parity check. 1×5
- (b) What is Piggybacking ? Explain stop and wait ARQ with timing diagram, when ACK is lost. 2+3
- (c) What is p-persistent CSMA ? Calculate the throughput of slotted ALOHA protocol. 2+3
- (d) Explain the features of a transparent bridge. Discuss the operation of bridges in different LAN environments. 2+3
4. (a) What are the important services provided by the network layer ? Compare virtual circuit and datagram approach. 3+4

- (b) What is IP addressing ? Describe the address representations according to address range. 2+4
- (c) Explain the features of M2M communication. Differentiate between leaky bucket and token bucket shaper. 3+4
5. (a) List the *three* types of services provided by Transport layer to Application layer. 4
- (b) How is a TCP connection established ? Explain typical three way handshake operation with a diagram. 2+4
- (c) What is a Modulo Function ? Explain the principle of Elliptic curve cryptography. 2+3
- (d) What is vulnerability ? List and explain Browser and Operating system related vulnerabilities. 2+3

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Note : (i) *Question No. 1 is compulsory and carries 40 marks.*

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1. (a) Define Network Topology. Compare Star and Bus topologies. 5
- (b) Define Hamming Code. Write the bit stream generated by Hamming code for 001100. 5
- (c) Explain the process of piggybacking with the help of an appropriate diagram. 5

P. T. O.

- (d) How does CSMA/CD differ from CSMA/CA ? 5
 - (e) Compare connection oriented with connectionless services. 5
 - (f) Define the term network congestion problem. Explain the methods to deal with it. 5
 - (g) Differentiate leaky bucket and token bucket traffic shaper mechanisms. 5
 - (h) Describe three-way handshake mechanism with the help of a diagram. 5
2. (a) Explain ATM network technology. Write its advantages and disadvantages. 6
- (b) Discuss the issues faced by the signal when it is transmitted over the transmission lines. 6
- (c) Define modulation. Why is it required ? Discuss the types of modulation. Why is Amplitude Modulation (AM) most susceptible to noise ? 8

3. (a) State the functionality of data link layer. Name different methods for framing. Give an example for each type of framing. 7
- (b) What are the limitations of stop and wait flow control mechanism ? Discuss how sliding window protocol deals with their issues. 6
- (c) Define vulnerable period. Draw throughput *vs.* load graph for pure ALOHA and slotted ALOHA. Give an expression for throughput with an assumption of no collision. 7
4. (a) Define IP address. Compare virtual circuit with datagram subnet. 5
- (b) Explain Adaptive and Non-adaptive routing algorithms. Describe the concept of flooding. 5
- (c) Define Count to Infinity problem. How does link state routing overcome with it ? Explain the link state routing operations. 5
- (d) How Border Gateway Protocol (BGP) solve count to infinity problem ? Name the routers identified by OSPF. 5

5. (a) Explain Quality of Services provided by the transport layer. 5
- (b) Compare and contrast the flow control. Explain the flow-control and buffering mechanism at the transport-layer. 5
- (c) Explain Nagle's algorithm. How does it overcome the problem of wastage of bandwidth ? 5
- (d) Discuss Virtual Private Network (VPN) standard. Explain its types. 5

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June, 2024

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Note : (i) *Question No. 1 is compulsory and carries 40 marks.*

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1. (a) Differentiate between Analog and Digital signals. Draw the diagrams for both. 5
- (b) Define vulnerable period. Give an expression of throughput in pure ALOHA. Also differentiate pure ALOHA with slotted ALOHA. 5

- (c) Define bridge. In which scenario bridge should be used ? What are the characteristics of it ? 5
- (d) Describe transmission and propagation delays. Explain the working of a fibre-optic cable. 5
- (e) List and explain the functionalities of various layers in OSI reference model. 5
- (f) Explain count to infinity problem with the help of an example. 5
- (g) Explain the features of M2M communication. Differentiate between Leaky bucket and Token bucket shaper. 5
- (h) Define cryptography, encryption, decryption and block-cipher. Give an example of modulo function. 5
2. (a) Describe Automatic Repeat Request (ARQ). Also discuss the following methods for flow and error control : 12
- (i) Stop and Wait ARQ
- (ii) Selective Repeat ARQ

- (b) Explain circuit and packet switching. Give an example where circuit switching should be applied. 8
3. (a) What do you mean by error detection ? Cyclic Redundancy Check (CRC) is used to detect which type of error ? Determine CRC for the bit sequence 1101011011 where the generator polynomial key is 10011. 7
- (b) Explain Wireless LAN protocols. What are the features of MACAW which extends MACA to improve the performance ? 6
- (c) What is Multiplexing ? Explain synchronous time division multiplexing. 7
4. (a) Explain the concept of congestion and routing in networks. Draw the graph for throughput and delay in poor and good routing. 5
- (b) Explain the working of Dijkstra's algorithm. 5

- (c) Define Hierarchical Routing. In which scenario, it is more advantageous ? Explain Reverse Path forwarding mechanism. 5
- (d) Explain the mechanism on which open loop algorithm work. How is congestion controlled in packet switched network ? 5
5. (a) Describe the services required by application layer from transport layer. 5
- (b) Enlist important features of UDP. Give an example where it can be used. 5
- (c) Explain Remote Procedure Call (RPC) with the help of an appropriate block diagram. 5
- (d) Find the secret key using Diffie Hellman for the case, where : 5

User 1 : Public Key = 33, Private key = 3

User 2 : Public key = 8, Private key = 8.

And User 1 is sender, User 2 is receiver.