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MCS-218

MASTER OF COMPUTER APPLICATIONS (MCA) (NEW)

Term-End Examination

June, 2023

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) 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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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) 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

(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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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) 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 Cell (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.

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

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

1. (a) What is the Internet backbone and how does it facilitate data transmission ? 5

(b) Define Internet Services. Explain its major categories. 5

(c) Describe star topology and discuss its advantages and disadvantages. 5

(d) Define data rate and signal rate. An analog signal carries 4 bits per signal and 1000 signal elements are sent per sec. Compute the bit rate. 5

(e) Draw constellation diagram for 4 PSK and 4 QAM. 5

(f) Draw Manchester and Differential Manchester encoding for the bit sequence 001100110011. 5

(g) Data link protocol almost always put CRC in trailer rather than in header. Why ? 5

(h) Illustrate the process of PCM with the help of a diagram. 5

2. (a) Differentiate between 10 Base T and 10 Base F. What is the minimum and maximum length of IEEE 802.3 Ethernet frame ? 5

(b) Explain hidden station and exposed station problem. 5

(c) Describe the operations of bridges in different LAN environment. 5

(d) Explain the services of Network layer. 5

3. (a) Discuss the format of an IP datagram and the process of IP datagram fragmentation. 5

(b) Discuss the concept of Quality of Service in transport services. 5

(c) Define cryptography. Why is it important in Network security ? 5

(d) Explain some of recent cyber attacks and their impacts. 5

4. (a) Describe stop and wait flow control mechanism. What is the limitation of it ? Which flow control protocol is used to overcome these limitations ? 8

(b) Compare and contrast the virtual circuit approach with datagram approach in packet switching. 6

(c) Explain different applications of WSN. 6

5. (a) Define routing problem. Explain shortest path routing algorithm. 7

(b) Differentiate between Traffic Policy and Traffic Shaping. 6

(c) Describe the usecases of IoT in home automation, smart cities, environment and health. 7

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1. (a) Discuss the Standard Internet Protocols and their roles. 5

(b) Discuss the concept of Signal to Noise ratio and its significance in data transmission. 5

(c) Find CRC for the frame 1101011011 with generator polynomial $x^3 + 1$. 5

(d) What do you mean by noise in a signal ? Briefly discuss the types of noise. 5

(e) Explain the importance of transmission media. 4

(f) Explain the process of analog to analog modulation. Discuss different types of encoding method for an analog signal. 5

(g) Explain pipelining in Go-Back-N ARQ with example. 6

(h) Enlist sublayers of data link layer. What are the key functions of these sublayers ? 5

2. (a) Discuss different types of Malware. 5

(b) List the challenges faced by ad-hoc networks. 5

(c) Explain the structure and functionality of UDP. 5

(d) Explain the difference between circuit switching and packet switching. 5

3. (a) Draw the timing diagram for piggybacking process in case where sender and receiver both transmitting the data. 5

(b) Give an expression for finding throughput of the system in pure ALOHA and draw the diagram to represent the relation between throughput and load. 5

(c) Discuss the advantages of P-persistent CSMA. 5

(d) How does cryptography contribute to network security ? 5

4. (a) Illustrate WSN topologies with the help of diagram. 6

(b) Explain the structure of WSNs and classification of WSNs. 7

(c) Describe the concept of link state routing and its significance. 7

5. (a) Discuss the concept of admission control, traffic policing and traffic shaping. 6

(b) Draw the MANET layer architecture and explain the functionality of each layer in it. 7

(c) Describe the different methods for framing in data link layer with example. 7

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