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Question Paper Code : 11240

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2026.

Fourth Semester

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Electronics and Communication Engineering

EC3401 – NETWORKS AND SECURITY

(Regulations 2021).

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. How does information get passed from one layer to the next in the Internet model?
2. Write a note on Ethernet (802.3).
3. Differentiate between interdomain and intradomain routing protocols.
4. How do routers use Internet Control Message Protocol?
5. Why HTTP is known as a stateless protocol?
6. Differentiate between open-loop congestion control and closed-loop congestion control.
7. How many bytes in state are affected by ShiftRows?
8. How can a probable-message attack be used for public-key cryptanalysis?
9. What are the differences between functional and side-channel bugs?
10. Differentiate between a combinational and a sequential Trojan.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Compare and contrast byte-stuffing and bit-stuffing. (7)
(ii) Explain about IEEE 802.11 with its architecture diagram. (6)

Or

- (b) Illustrate in detail about the seven layers of the OSI architecture model with neat diagram.

12. (a) (i) In an IPv4 datagram, the M bit is 0, the value of HLEN is 5, the value of total length is 200, and the offset value is 200. What is the number of the first byte and number of the last byte in this datagram? Is this the last fragment, the first fragment, or a middle fragment? (6)
- (ii) Compare and contrast between unicast and multicast routing. (7)

Or

- (b) (i) With neat diagram of IPv6 Datagram Format, explain about its functionality. (7)
- (ii) Illustrate about the Three transition strategies of IPv4 to IPv6 with diagrams. (6)
13. (a) A client uses TCP to send data to a server. The data are 16 bytes. Calculate the efficiency of this transmission at the TCP level (ratio of useful bytes to total bytes). Calculate the efficiency of transmission at the IP level. Assume no options for the IP header. Calculate the efficiency of transmission at the data link layer. Assume no options for the IF header and use Ethernet at the data link layer.

Or

- (b) (i) In a leaky bucket used to control liquid flow, how many gallons of liquid are left in the bucket if the output rate is 5 gal/min, there is an input burst of 100 gal/min for 12 s, and there is no input for 48 s? (5)
- (ii) Explain in detail about domain name system and its distribution of name space. (8)
14. (a) (i) Explain in detail about the structure of AES Encryption Process with neat diagram. (8)
- (ii) DSA specifies that if the signature generation process results in a value of $s = 0$, a new value of k should be generated and the signature should be recalculated. Explain why? (5)

Or

- (b) (i) Write down the RSA algorithm and explain its working nature. (8)
- (ii) Suppose $H(m)$ is a collision-resistant hash function that maps a message of arbitrary bit length into an n -bit hash value. Is it true that, for all messages x, x' with $x \neq x'$, we have $H(x) \neq H(x')$. Explain your answer. (5)

15. (a) (i) Describe different types of security vulnerabilities in hardware. (6)
 (ii) Explain in detail about the features of Blockchain technology. (7)

Or

- (b) (i) The RSA-T100 Trojan is triggered when a 32-bit specific plaintext is applied. Calculate the probability of triggering this Trojan if one uses random patterns as plaintext. (6)
 (ii) Compare and contrast between side-channel attacks and physical attacks in hardware. (7)

PART C — (1 × 15 = 15 marks)

16. (a) For each of the following four networks, discuss the consequences if a connection fails.
 (i) Five devices arranged in a mesh topology
 (ii) Five devices arranged in a star topology (not counting the hub)
 (iii) Five devices arranged in a bus topology
 (iv) Five devices arranged in a ring topology.

Or

- (b) An ISP is granted a block of addresses starting with 190.100.0.0/16 (65,536 addresses). The ISP needs to distribute these addresses to three groups of customers as follows :
- The first group has 64 customers; each need 256 addresses.
 - The second group has 128 customers; each need 128 addresses.
 - The third group has 128 customers; each need 64 addresses.

Design the subblocks and find out how many addresses are still available after these allocations.

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