VIT
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

School of Computer Science and Engineering

Fall Semester 2024-2025

Continuous Assessment Test – I

Programme Name & Branch: B.Tech. CSE (All Programs) **SLOT: D2+TD2**

Course Code & Name: BCSE308L- Computer Networks

Class Numbers: Common to All Batches

Faculty Names: Common to All Batches

Exam Duration: 90 Min. **Maximum Marks: 50**

Answer KEY

Q.No.	Question	Max Marks	CO	BL
1.	a. A defence organization is planning to have the network built for their newly constructed office. There are 3 scientists working on confidential projects. Each scientist has a team of 5 engineers. Sketch a suitable topology with justification. (5 marks) Star topology Sketch- 2 marks Justification – 3 marks Scalability Performance Security Maintenance and troubleshooting Redundancy b. A company is hiring freshers to work on the Application layer and Transport layer. Identify any 4 protocols with their purpose, which the candidate has to be familiar to be eligible for the job. (5 marks) List of Protocols- 1 mark Purpose of each protocol – 4 marks Application Layer HTTP	10	CO1	BL 2

	FTP SMTP DNS TELNET SNMP Transport TCP UDP			
2.	i. 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? (2 Marks). Data: Bandwidth = 10 Mbps = 10^6 bps Data network can pass on average = 12,000 frames in 60 seconds. 1 frame = 10,000 bits Calculation: Therefore, data network can pass in 60 seconds = 12,000 × 10,000 Throughput is data network can pass in 1 second Throughput = $\frac{12,000 \times 10,000}{60}$ = 2,000,000 bps = 2 Mbps. ii. What are the propagation time and the transmission time for a 2.5-kbyte message (an e-mail) if the bandwidth of the network is 1 Gbps? Assume that the distance between the sender and the receiver is 12,000 km and that light travels at 3×10^8 m/s. (3 Marks)	10	CO2	BL 4

Given Data:

- **Message Size**: 2.5 kbytes (or 2.5 × 1024 bytes = 2560 bytes)
- **Bandwidth**: 1 Gbps (1 gigabit per second)
- **Distance**: 12,000 km
- **Speed of Light**: 3×10^8 m/s

1. Transmission Time

Transmission time (T_t) is given by the formula:
$T_t = \frac{\text{Message Size (in bits)}}{\text{Bandwidth}}$

First, convert the message size from bytes to bits: $\text{Message Size (in bits)} = 2560 \text{ bytes} \times 8 \text{ bits/byte} = 20480 \text{ bits}$

Then: $T_t = \frac{20480 \text{ bits}}{1 \text{ Gbps}} = \frac{20480}{10^9}$ seconds $T_t = 20.48 \times 10^{-6}$ seconds $T_t =$ 20.48 microseco.

2. Propagation Time

Propagation time (T_p) is given by the formula:
$T_p = \frac{\text{Distance}}{\text{Propagation Speed}}$

First, convert the distance from kilometers to meters: $\text{Distance} = 12,000 \text{ km} \times 1000 \text{ m/km} = 12,000,000 \text{ meters}$

Then: $T_p = \frac{12,000,000 \text{ meters}}{3 \times 10^8 \text{ m/s}}$ $T_p = 0.04$ seconds $T_p = 40$ milliseconds

Summary

- **Transmission Time**: 20.48 microseconds
- **Propagation Time**: 40 milliseconds

iii. A path in a digital circuit-switched network has a data rate of 1 Gbps. The exchange of 1000 bits is required for the setup and teardown phases. The distance between two parties is 5000 km. Answer the following questions if the propagation speed is 2×10^8 m. What is the total delay if 10000 bits of data are exchanged during the data- transfer phase? (5 marks)

We assume that the setup phase is a two-way communication and the teardown phase is a one-way communication. These two phases are common for all three cases. The delay for these two phases can be calculated as three propagation delays and three transmission delays or
3 [(5000 km)/ (2 ×10^8 m/s)]+ 3 [(1000 bits/1 Mbps)] = 75 ms + 3 ms = 78 ms

We assume that the data transfer is in one direction; the total delay is then delay for setup and teardown + propagation delay + transmission delay

Total delay= 78+25+10=113ms

3.	Relevant points substantiate the need for switching techniques in data communication. With a neat diagram, discuss the workings of packet switching approaches. (2+4+4 marks) Need of switching – 2 marks	10	CO2	BL 2

	Datagram (Sketch and explanation)– 4 marks Virtual Circuit packet switching (Sketch and explanation)–- 4 marks			
4.	a) What kind of error is undetectable by the checksum illustrate with an example? (3 Marks) • The main problem is that the error goes undetected if one or more bits of a subunit is damaged and the corresponding bit or bits of a subunit are damaged and the corresponding bit or bits of opposite value in second subunit are also damaged. This is because the sum of those columns remains unchanged. b) Given the data word 1111011111 and the divisor 11011, i. Show the generation of the code word at the sender site (using binary division). (4 Marks) ii. Show the checking of the code word at the receiver site (assume no error). (3 Marks) CRC at sender -1010 Codeword- 11110111111010 CRC at receiver -0000	10	CO3	BL 3
5.	The source wants to transmit the message M = 11010110001 to the receiver over a noisy channel. Assume sixth bit is flipped during the transmission. a. Show the code generation at sender side (4 marks) **Steps to Encode Using Hamming Code:** 1. **Determine the Number of Parity Bits:** The number of parity bits r needed for a data word of length m can be determined by the formula: $2^r \geq m + r + 1$ where m is the length of the data bits. For $m = 11$ (data bits): • $2^r \geq 11 + r + 1$ • Solve iteratively to find r: • For $r = 4$, $2^4 = 16$, which satisfies $16 \geq 11 + 4 + 1$. Thus, 4 parity bits are needed. 2. **Positioning the Parity Bits:** Insert parity bits at positions that are powers of 2: • Positions: 1, 2, 4, 8 Considered bit from right r1-0 r2=0 r4-0 r8-0 b. Show how does the receiver find whether the received code word has error or not. (4 marks)	10	CO3	BL 4

	0110 c. What kinds of errors it cannot determine? Why and justify. (2 marks) Two-bit errors Errors affecting Parity bits			