VIT

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

REG.NO.:

SLOT: B1+TB1

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING
CONTINUOUS ASSESSMENT TEST - I
FALL SEMESTER 2026-2027

Programme Name & Branch	: B. Tech Computer Science and Engineering
Course Code and Course Name	: BACSE203 Computer Networks
Faculty Name(s)	: ILANTHENRAL K P S K, VIMALA DEVI K, MANIKANDAN G, PRAKASH G, SARWESH P, S M FAROOQ, BADRINATH N, RAGAVAN K, PADMAVATHY T, SARANYA P, GOPINATH M, RAJAN SHRIVASTAVA, RAKHI MOL V, JIM SOLOMON RAJA D, RAJASEKAR V R, ERAPANENI GAYATRI, THIRUVENKADAM T
Class Number(s)	: VL2026270101741, 1748, 1671, 1676, 1682, 1686, 1693, 1700 1706, 1710, 1715, 1718, 1721, 1724, 1728, 1731, 1735
Date of Examination	: 10.08.2026 FN
Exam Duration	: 90 minutes Maximum Marks: 50

General instruction(s):

- Answer All Questions
- M - Max mark; CO – Course Outcome; BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)
- Course Outcomes:
  CO1. Interpret the different building blocks of networks.
  CO2. Analyze the error and flow control mechanisms for connecting a network.

No.	Question	M	CO	BL
1.	A software developer working from home uploads a new version of a mobile application to GitHub using a laptop connected to a broadband Internet connection. Later, another developer in a different city downloads the updated project files onto a workstation for further development. **a)** Explain how the application files are processed through the seven layers of the OSI Reference Model at the sender's side, stating the function of each layer during transmission. (5 Marks) b) Explain how the downloaded files are processed through the seven layers of the OSI Reference Model at the receiver's side. Identify the Protocol Data Unit (PDU) at each layer and provide an appropriate protocol example for every OSI layer. (5 Marks)	10	CO1	BL3
2.	A space research organization operates a satellite ground station that continuously receives high-definition Earth observation images from a low-orbit satellite through a dedicated **40 Mbps** communication link. The distance between the satellite ground station and the central image processing center is **2,400 km**, and the propagation speed of signals in the communication medium is **2.5×10^8 m/s**. The satellite captures and transmits one image every **20 seconds** for scientific analysis. a) Calculate the propagation delay of the communication link and determine the bandwidth-delay product (BDP) of the link. b) Let the size of each image be x bits. Determine the minimum value of x required to ensure that the transmitter remains continuously busy	10	CO1	BL5

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	while transmitting the image. If each image has a size of 160 MB, calculate the total transmission time required to send the image from the satellite ground station to the processing centre, considering both transmission and propagation delays. Show all calculations clearly.			
3.	a) A hospital is installing a patient monitoring system where medical devices continuously transmit vital signs to a central monitoring station. Since reliable clock synchronization is essential, the network administrator must choose an appropriate line encoding technique. Compare all the encoding schemes with respect to their rule, clock recovery and efficiency and recommend the most suitable encoding scheme for the above application.	5	CO2	BL4
	b) A high-speed metro rail network continuously transmits signalling and train location information between trackside control units and moving trains. The communication link experiences occasional packet loss due to electromagnetic interference. The railway authority is considering **Sliding Window**, **Go-Back-N ARQ**, and **Selective Repeat ARQ** protocols to achieve reliable and efficient data transmission. Discuss how these three protocols would perform under the given communication conditions with respect to best reliability and bandwidth utilization for the railway signalling system.	5		
4.	A digital library management system transfers the message **"DIGITAL LIBRARY BOOKS"** from a branch library to the central server over a communication network. To ensure data integrity during transmission, the system uses the **16-bit Internet Checksum** for error detection. Calculate the 16-bit Internet checksum for the message and demonstrate how the receiver verifies the received data. Assume each 16-bit word consists of 4 hexadecimal digits (2 ASCII characters). The ASCII hexadecimal values for A–Z are 0x41–0x5A, and the space character is 0x20. Explain how the receiver detects the error using the Internet checksum.	10	CO2	BL3
5.	A smart manufacturing company uses an Industrial Internet of Things (IIoT) network to monitor the health of its production machines through wireless sensors. Since wireless communication is susceptible to electrical interference, the company employs **Hamming Code (Single Error Correction)** to ensure reliable transmission of sensor data. One of the sensors generates the **11-bit data message** 10101100110, which is encoded using the Hamming coding technique before transmission. During transmission, electrical noise causes the **8th bit** of the Hamming code word to be inverted. Determine the number of parity bits required, construct the Hamming code for the given message, write the received code word after the error is introduced, compute the syndrome using the parity check bits, identify and correct the erroneous bit, and finally recover the original 11-bit data message.	10	CO2	BL3

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