



### III SEMESTER BTECH. (INFORMATION TECHNOLOGY/COMPUTER AND COMMUNICATION ENGINEERING) END SEMESTER EXAMINATIONS, JANUARY 2022

#### SUBJECT: PRINCIPLES OF DATA COMMUNICATIONS [ICT 2156]

#### REVISED CREDIT SYSTEM

(29/01/2022)

TIME: 75 MINUTES

PART - B

MAX. MARKS: 20

#### Instructions to candidates

- Answer **ALL** questions.
- Missing data, if any, may be suitably assumed.

- 1A. Consider the bridged-network given in Figure Q1A. Check the presence of loops in the network. Make the network loop-free by applying Spanning tree algorithm. Show the detailed steps of working. Show the final network (with no loops) as well.

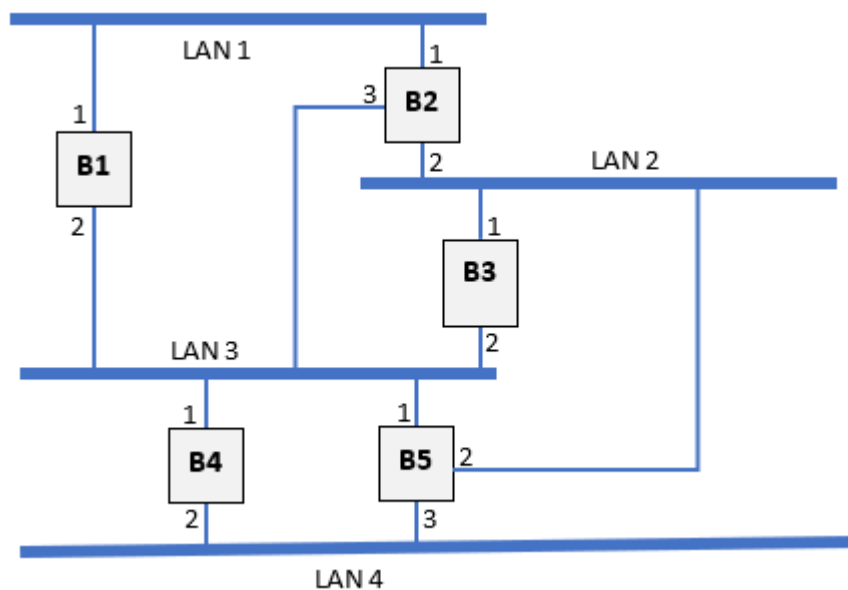


Figure Q1A

5

- 1B. In the Figure Q1B, the data rate of the link is 10 Mbps, the distance between stations A and C is 2000 m, and the propagation speed is  $2 \times 10^8$  m/s. Station A starts sending a long frame at time  $t_1 = 0$ ; station C starts sending a long frame at time  $t_2 = 3\mu s$ . The size of the frame is long enough to guarantee the detection of collision by both stations. Determine:

- The time when station C hears the collision ( $t_3$ ).
- The time when station A hears the collision ( $t_4$ ).
- The number of bits station A has sent before detecting the collision.
- The number of bits station C has sent before detecting the collision.

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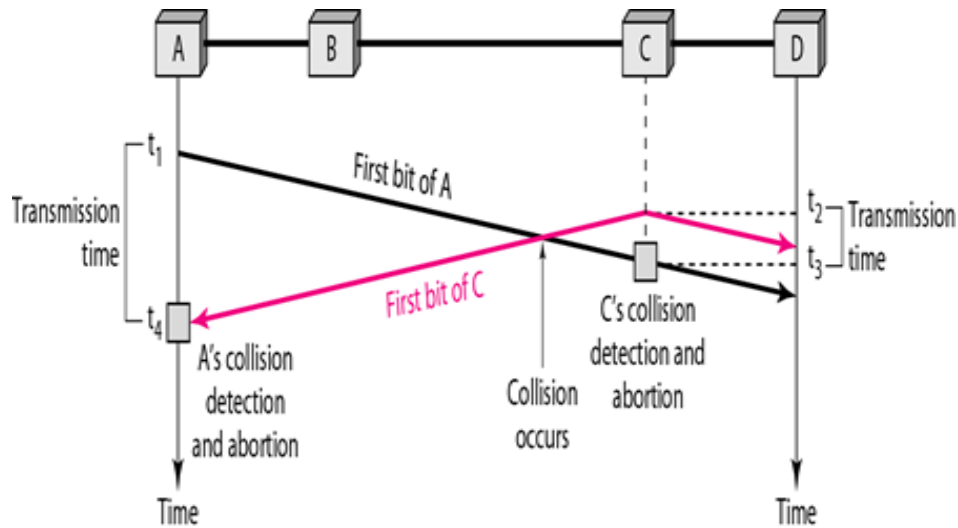


Figure Q1B

- 1C. Consider a device A that sends the data bits 1010 to another device B. Device B receives the codeword 1010 000. Find out if device B has received the correct codeword using even parity Hamming code method. If there is/are error(s), find the position. 2
- 2A A character-interleaved time division multiplexer is used to combine the data streams of a number of 150bps asynchronous terminals for data transmission over a 2600-bps digital line. Each terminal sends asynchronous characters consisting of 7 data bits, 1 parity bit, 1 start bit, and 2 stop bits. Assume that one synchronization character is sent every 15 data characters and, in addition, at least 4% of the line capacity is reserved for pulse stuffing to accommodate speed variations from the various terminals.
- Determine the number of bits per character.
  - Determine the number of terminals that can be accommodated by the multiplexer.
  - Sketch a possible framing pattern for the multiplexer. 5
- 2B Two neighboring nodes (A and B) use a sliding-window protocol with a 3-bit sequence number. As the ARQ mechanism, go-back-N is used with a window size of 4. Assuming A is transmitting and B is receiving, show the window positions for the following succession of events:
- Before A sends any frames
  - After A sends frames 0, 1, 2 and receives acknowledgment from B for 0 and 1
  - After A sends frames 3, 4, and 5 and B acknowledges 4 and the ACK is received by A. 3
- 2C Give the physical characteristics of Fiber Optical Medium. Explain the Graded-index multimode propagation with respect to optical fiber communication. 2