

# National Institute of Technology Rourkela

## Department of Computer Science and Engineering

Mid-Semester Examination (Spring) 2019-2020

Subject: **Computer Networks**

Full Marks: **30**

Subject Code: **CS3002**

Duration: **2 Hours**

Answer all questions.

*Figures at the right margin indicate marks.*

*All parts of a question must be answered at one place.*

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1. Answer the following, [5×2=10]
- (a) What is Piggybacking?
  - (b) What is byte stuffing? Explain with an example.
  - (c) Construct the Walsh Orthogonal spreading sequences of length 16.
  - (d) Suppose that the ALOHA protocol is used to share a 56kbps satellite channel. Let the frames are 1000 bits long. Find the maximum throughput of the system in frames/second.
  - (e) Perform bit de-stuffing for the following sequence, 11010111110010111110101011110110.
2. (a) A channel using random access protocols has three stations on a bus with end-to-end propagation delay  $\tau$ . Station A is located at one end of the bus and stations B and C are located at the other end of the bus. Frames arrive at the three stations and are ready to be transmitted at stations A, B, and C at the respective times  $t_A = 0, t_B = \tau/2$ , and  $t_C = 3\tau/2$ . Frames require transmission times of  $4\tau$ . In appropriate figures, with time as the horizontal axis, show the transmission activity of each of the stations for,
- i. ALOHA
  - ii. Non-persistent CSMA
  - iii. Non-persistent CSMA-CD [6]
- (b) Derive the efficiency of token passing control access protocol for delayed token reinsertion (same as Single token single frame). Suppose there are 10 stations in a network and the transmission time and propagation delay are 1ms and 2ms respectively. What is the efficiency of the network that uses token passing method? [2]
- (c) What will be the efficiency of a Stop and Wait protocol, if the transmission time for a frame is 20ns and the propagation time is 30ns? [2]
3. (a) A telephone modem is used to connect a personal computer to a host computer. The speed of the modem is 56kbps and the one-way propagation delay is 100ms. Find the efficiency of stop-and-Wait ARQ if the frame size is 256 bytes. [4]
- (b) Consider a LAN with four nodes S1, S2, S3 and S4. Time is divided into fixed-size slots, and a node can begin its transmission only at the beginning of a slot. A collision is said to have occurred if more than one node transmit in the same slot. The probabilities of generation of a frame in a time slot by S1, S2, S3 and S4 are 0.1, 0.2, 0.3 and 0.4, respectively. What is the probability of sending a frame in the first slot without any collision by any of these four stations. [3]
- (c) A bit stream 1101011011 is transmitted using the standard CRC method. The generator polynomial is  $x^4 + x + 1$ . What is the actual bit string transmitted? [3]

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