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**Institute of Informatics & Communication (UDSC)**  
M.Sc. (Informatics), Semester-III Examination, December 2018  
**Telecommunication Networks & Technology – IT33**

Time: 3 hrs.

MM: 75

**Answer any five questions.** Please write your roll number on the top of this paper.

- Q.No. 1a. Calculate the frequency spectrum and absolute bandwidth for following signal  $s(t) = (4/\pi) [\sin(2\pi ft) + (1/3)\sin(2\pi(3f)t) + (1/5)\sin(2\pi(5f)t) + (1/7)\sin(2\pi(7f)t)]$  2
- b. Define channel capacity. What key factors affect channel capacity and describe the factors. 3
- c. Two hosts are connected via a packet switch with 107 bits per second links. Each link has a propagation delay of 20 microseconds. The switch begins forwarding a packet 35 microseconds after it receives the same. If 10000 bits of data are to be transmitted between the two hosts using a packet size of 5000 bits, Calculate the time elapsed between the transmission of the first bit of data and the reception of the last bit of the data. 3
- d. Generate 16 bit CDMA chip sequence. 3
- e. Compare the advantage and disadvantages of CDMA, FDMA and TDMA with each other. 4
- Q.No.2 Describe stop-and-wait flow control and sliding-window flow control. What is the advantage of sliding-window flow control compared to stop-and-wait flow control? What is piggybacking? Describe how duplicate packet problem and missing packet problem is resolved. 15
- Q.No.3a A sender uses the Stop-and-Wait ARQ protocol for reliable transmission of frames. Frames are of size 1000 bytes and the transmission rate at the sender is 80 Kbps (1Kbps = 1000 bits/second). Size of an acknowledgement is 100 bytes and the transmission rate at the receiver is 8 Kbps. The one-way propagation delay is 100 milliseconds. Calculate the sender's throughput, assuming there is no frame is lost. 3
- b. In Stop and wait protocol every 3rd packet is lost and we need to send total 10 packets so how many transmission it took to send all the packets? 3
- c. In GB3 if every 5th packet is lost & we need to send 10 packets so how many retransmissions are required? 3
- d. In S&W protocol if Error probability is  $p$  and no. of packets to send is ' $n$ '. How many packets we have to send? 3
- e. If there is  $K$  bits sequence no. define require sender window size and receiver window size for S&W, GBN & SR? 3
- Q.No.4a. Describe blocking or non-blocking switching with example in circuit switching 4
- b. Two channels, one with a bit rate of 190kbps and another with a bit rate 180 kbps are to be multiplexed using pulse stuffing TDM with no synchronization bits. Answer the following questions: 4
- i. What is the size of a frame in bits?
- ii. What is the frame rate?
- iii. What is the duration of a frame?
- iv. What is the data rate?
- c. Describe Time-division switching and its type. What is Inverse Multiplexing. 3

- d. Define Alternate and Adaptive routing in circuit switched network with example. What are the different types of Signaling Techniques used in circuit switched network. 3
- e. As the resources are reserved between two communicating end systems in circuit switching, this is achieved for 1
- authentication ?
  - guaranteed constant rate
  - reliability
  - store and forward
- Q.No.5a. Compare circuit switching, message switching and packet switching. 5
- b. Describe working of switching in Virtual Circuit and Datagram packet switching 5
- c. Most packet switches use this principle 2
- Stop and wait
  - Store and forward
  - Both Stop and wait and Store and forward
  - None of the mentioned
- d. If there are N routers from source to destination, total end to end delay in sending packet P (L: number of bits in the packet, R: transmission rate) 3
- Q.No.6. Describe the working of X.25 and Frame relay protocol. Compare X.25 and Frame relay protocol. Discuss their merit and demerits. 15
- Consider a company X wants to transfer 86.4 Tbits of backup data from Delhi to Bangalore over 10 Gbits/s link daily which type of switching network should company X chose. Arrange switching techniques in terms of priority for best performance
- Message Switching,
  - Virtual packet switching,
  - Datagram packet switching,
  - Circuit Switching.
- Explain your order of preference.