Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

III SEMESTER BTECH. (INFORMATION TECHNOLOGY/COMPUTER AND COMMUNICATION ENGINEERING) MAKE UP EXAMINATIONS, MARCH 2022

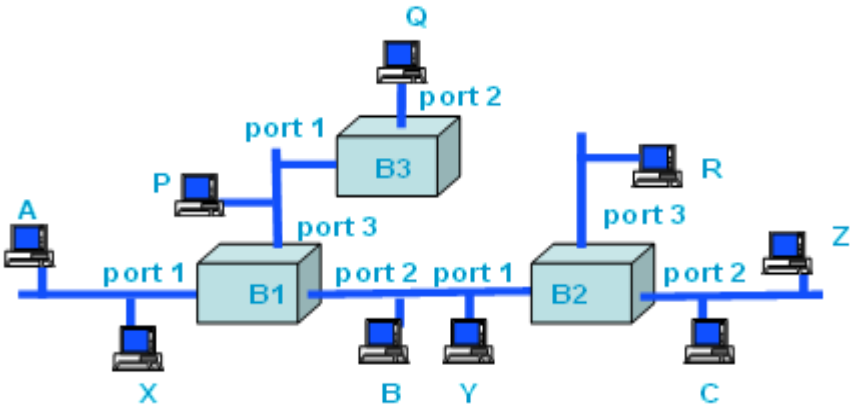
SUBJECT: PRINCIPLES OF DATA COMMUNICATIONS [ICT 2156]

REVISED CREDIT SYSTEM

TIME:3HRS **MAX. MARKS: 50**

Instructions to candidates

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

1A.	Consider the bridged network given in Figure. Q.1A. Show the stepwise building of forwarding table for the bridges B1, B2, B3 when packet exchange occurs in the order as given below. i) X sends to Q ii) Z sends to R iii) P sends to B iv) Y sends to X v) Z sends to P  Figure. Q.1A	5
1B.	A slotted ALOHA network transmits 200-bit frames on a shared channel of 200 kbps. What is the throughput if the system (all stations together) produces the following number of frames per second? i) 1000 frames per second ii) 500 frames per second iii) 250 frames per second	3
1C.	A digital signalling system is required to operate at 4800bps. i) If a signal element encodes a 4-bit word, what is the minimum required bandwidth of the channel if we assume a noise free system? ii) What will be the bandwidth, if 4 signal levels are used instead?	2

2A	Explain QPSK and OQPSK with a neat diagram. Draw QPSK and OQPSK waveform for the following sequence. Sequence: 1011000111	5
2B	Derive an equation to find the radio line of sight between an antenna and the horizon in kilometres. Assume 'h' as the antenna height in meters. If the maximum distance between two antennas for LOS transmission is 50Km, find the height of the transmitting and the receiving antennas. Assume that the optical LOS for both the antennas are same.	3
2C	Consider the scenario in which station A is sending frame to station B using Go-back N ARQ technique. Station B receives frame i and sends RR (i+1) which suffers an error in transmit and station A does not soon send additional frame. Explain how the transmission of the frames takes place after the damaged RR.	2
3A	A data $D(X) = X^{11}+ X^9+X^6 +X^5+X^4+X^3+X+1$ is to be transmitted and the given pattern is $P(X) = X^5 + X^4 + X^3+X^2+X+1$. What is the transmitted message? The receiver receives the message with an error in the 7^{th} bit from the MSB of the received message, detect that there is an error using modulo 2 arithmetic.	5
3B	Which are the most significant transmission impairments that occurs? Briefly explain each of the impairment with an example.	3
3C	Given a channel with an intended capacity of 20 Mbps, the bandwidth of the channel is 3 MHz. Assuming white thermal noise, what signal-to-noise ratio is required to achieve this capacity?	2
4A	With the help of a diagram, explain the layer-to-layer communication happening between two devices connected through intermediate node(s) with reference to OSI model.	
4B	Explain Statistical time division multiplexing. Ten 2400-bps lines are to be multiplexed using TDM. Assuming that we wish to limit average TDM link utilization to 0.6, and assuming that each TDM link is busy 60% of the time, what is the capacity required for statistical TDM?	3
4C	Explain the different levels of addresses used in a network and map them to corresponding layers of TCP/IP architecture.	
5A	Assuming signal level for the preceding bit is high, sketch neat waveforms for Manchester, Differential Manchester, Bipolar AMI, NRZI and Differential PSK digital encoding techniques for the input digital data 1100011101. Assume that the signal level for the preceding bit for NRZI was high; the most recent preceding 1 bit (AMI) has a negative voltage, and the most recent preceding 0 bit (pseudo ternary) has a negative voltage.	5
5B	Explain parabolic reflective antenna with a neat diagram. what is the effective area for a parabolic reflective antenna with a diameter of 1.5 m, operating at 6 GHz?	3
5C	Differentiate Twisted and Co-axial cable.	2