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MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

III SEMESTER B.TECH. (INFORMATION TECHNOLOGY)

END SEMESTER EXAMINATIONS, NOVEMBER 2017

SUBJECT: PRINCIPLES OF DATA COMMUNICATION [ICT 2104]

REVISED CREDIT SYSTEM
(25/11/2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A. How is the damaged frame, damaged RR and damaged REJ handled in Go-Back-N ARQ? Support this with a suitable example. Show how it differ from Selective-Reject ARQ. 5

1B. Suppose a transmitter produces 50 W of power. 3
i) Express the transmit power in units of dBm and dBW.
ii) If the transmitter's power is applied to a unity gain antenna with a 900-MHz carrier frequency, what is the received power in dBm at a free space distance of 100 m?
iii) Repeat part (ii) for a distance of 10 km.
iv) Repeat part (iii) but assume a receiver antenna gain of 2.

1C. What is the channel capacity for a teleprinter channel with a 300-Hz bandwidth and a signal-to-noise ratio of 3 dB, where the noise is white thermal noise? A signalling system is required to operate at 9600 bps and if the signal element encodes 4 bit word, what is the minimum bandwidth required for the channel? 2

2A. Explain with block diagram the QPSK and OQPSK modulation technique. Provide relevant equations. For an input signal of 1 -1 1 1 -1 -1 -1 1 1 1 draw the inphase, quadrature phase components and obtain the phases of the output signal. 5

2B. In a CRC error-detecting scheme, choose the pattern $P(x) = x^4 + x + 1$. Encode the message bits **1 0 0 1 0 0 1 1 0 1 1.** 3
i) Suppose the channel introduces an error pattern **1 0 0 0 1 0 0 0 0 0 0 0 0 0 0** (i.e., a flip from 1 to 0 or from 0 to 1 in positions 1 and 5, what is the received pattern? Can the error be detected?
ii) Repeat part (i) with error pattern **1 0 0 1 1 0 0 0 0 0 0 0 0 0 0**

2C. For some radio transmission in free space, signal power is -6 dB for a distance of 1 km. For the same distance using wired transmission the signal power is -3 dB. What will be the signal power for a distance of 2, 4, 8 and 16 km ?. 2

3A. What are the operations that are possible in the HDLC protocol? Write the details of the frame formats and control field for the different types of data and control messages. 5

3B. With neat diagram for the transmitter and receiver, explain synchronous TDM system. Assume that there are three channels and time to send one character is the smallest time interval required. If three messages "Learn", "Data", "Comm" were to be sent using TDM and FDM methods, how will it be interpreted? 3

3C. Given the waveform shown in Fig. Q.3C belonging to Manchester encoded binary data stream, determine the beginning and end of the bit periods and give the digital data sequence. 2

Fig. Q.3C

4A. Explain the process of MFSK modulation in conjunction with FHSS. Given the PN sequence as **00 11** and the input binary data is **01 11 00 11**, explain the encoding technique using four different frequencies taking the data input two bit at a time. 5

4B. Compare the three types of guided transmission media in terms of their transmission characteristics. 3

4C. What is the thermal noise power density at room temperature? Given the effective noise temperature as 294 K and a bandwidth of 10 MHz, what is the thermal noise level at the receiver's output? 2

5A. Explain the various transmission impairments which are specific to wireless media. Compare the various wireless propagation methods. 5

5B. What is the effect of packet size on the transmission time? Show this with an example for packet and circuit switching. 3

5C. Suppose a file of 10,000 bytes is to be sent over a line at 2400 bps. Calculate the overhead in bits, and in time when data is sent in frames. 2

i)Each asynchronous communication is having a frame with a one start bit and a stop element of length one bit, and 8 bits to send each character. The character consists of all data bits, with no parity bit.

ii)Each synchronous communication is having a frame of 1000 characters (8000 bits) and an overhead of 48 control bits per frame.