E 4207

(Pages : 3)

Reg. No. : .....

Name : .....

Fourth Semester B.Tech. Degree Examination, August 2018
(2013 Scheme)
13.404 : DATA COMMUNICATION (FR)

Time : 3 Hours

Max. Marks : 100

PART – A

Answer **all** questions. **Each** question carries **4** marks.

1. What are the possible propagation modes when propagating light along optical channels ?

2. Show the Manchester and differential Manchester encoding for the bit pattern 1001111100010001.

3. Distinguish between forward error correction versus error correction by retransmission.

4. Suppose the message 1011001001001011 is protected from errors using the polynomial $x^8 + x^2 + x^1 + 1$. Determine the message that should be transmitted.

5. Write down the advantages of packet switching over circuit switching.

PART – B

Answer **one full** question from **each** Module.

Module – 1

6. a) Given a channel with an intended capacity of 20 Mbps, the bandwidth of the channel is 3 MHz. Assuming white thermal noise, what is the signal-to-noise ratio required to achieve this capacity ? **6**

   b) What are the major advantages and disadvantages of microwave transmission ? **6**

P.T.O.

c) Explain the following :

i) Interlacing

ii) Signal-to-noise ratio

iii) Intersymbol interference. **8**

OR

7. a) A line has a signal-to-noise ratio of 2000 and a bandwidth of 5000 KHz. What is the maximum data rate supported by his line ? **6**

b) Discuss in detail about antennas used for microwave communication. **6**

c) How do you measure the theoretical channel capacity using Shannon formula ? Explain with example. **8**

Module – 2

8. a) Consider a PCM system in which 30 channels are to be time division multiplexed. The bandwidth of each channel is 3 kHz. The sampling rate is 33.33% higher than the theoretical minimum and 8 bits are used for each sample. Determine the required bit rate and find the minimum required transmission bandwidth. **8**

b) Explain the approaches by which Shannon and Nyquist places an upper limit on the bit rate of a channel. How they are related with each other ? **8**

c) Write short notes on FSK method. **4**

OR

9. a) Given the narrow audio bandwidth of a telephone transmission facility, a nominal SNR of 56dB and a certain level of distortion,

i) What is the theoretical maximum channel capacity of traditional telephone lines ?

ii) What is the actual maximum channel capacity ?

iii) Repeat (i) and (ii) for 0.2% of distortion. **10**

b) With suitable examples, illustrate the various methods used to encode the analog data into digital signals. **10**

Module – 3

10. a) Explain how synchronous time division multiplexing works. **5**

    b) Distinguish between WDM and DWDM. **5**

    c) Given the 11-bit combination 1001101$p_1p_2p_3p_4$, which is encoded with four redundant bits for single error correction, use odd parity to determine the values of the redundant bits ? Demonstrate the single-error-correcting power of the resulting 11-bit combination be deliberately inserting a single error in the sixth position and performing a complete check. **10**

OR

11. a) Why would you expect a CRC to detect more errors than a parity bit ? **5**

    b) Illustrate the convolution encoding and decoding process with suitable examples. **15**

Module – 4

12. a) Describe in detail about packet switching networks and its merits and demerits. **10**

    b) Consider an MFSK scheme with f_c = 250 kHz, f_d = 25 kHz and M = 8.

    i) Make a frequency assignment for each of the 8 possible 3-bit data combinations

    ii) Apply FHSS to this MFSK scheme with k = 2. Expand the results of (i) to show the 4 × 8 = 32 frequency assignments. **10**

OR

13. a) Name the main elements of GSM system architecture and describe their functions. **5**

    b) How is GSM system security maintained ? **5**

    c) Suppose that A, B and C are simultaneously transmitting 0 bits using a CDMA system with the chip sequences

    A: 0 0 0 1 1 0 1 1

    B: 0 0 1 0 1 1 1 0

    C: 0 1 0 1 1 1 0 0

    D: 0 1 0 0 0 0 1 0

    i) What is the resulting chip sequence ?

    ii) A CDMA receiver gets the following chip (– 1 + 1 – 3 + 1 – 1 – 3 + 1 + 1). Assuming the chip sequences defined in the above problem, which stations transmitted and which bits did each one send ? **10**