T.E. (Computer) (Semester – I) Examination, 2009
DATA COMMUNICATIONS (2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *i) Answer **any three** questions from **each** Section.*
*ii) Answers to the **two** Sections should be written in **separate** books.*
*iii) Neat diagrams must be drawn **wherever** necessary.*
*iv) Black Figures to the **right** indicate **full** marks.*
*v) Assume suitable data, **if necessary**.*

SECTION – 1

1. a) Explain Quadrature Amplitude Modulation (QAM). What are its advantages ? **8**

   b) Determine power efficiency n and the percentage of the total power carried by the sidebands of the AM wave for tone modulation when modulation Index $\mu = 0.5$ and $\mu = 0.3$. **4**

   c) Explain in short the concept behind Vestigial Sideband Modulation (VSB) along with its suitable application. **6**

   OR

2. a) Draw and explain the block diagram of a Frequency Mixer (Converter). Where it is used ? **6**

   b) Explain the operation of Phase Locked Loop Circuit. Why it has a important significance in Analog Modulation ? **8**

   c) An angle modulated signal with carrier frequency $\omega c = 2\Pi * 10^5$ is described by the equation $\varnothing em\ (t) = 10 \cos (\omega ct + 5 \sin 3000\ t + 10 \sin 2000\Pi\ t)$. Find the power of the modulated signal and frequency deviation. **4**

P.T.O.

3. a) Explain in short what is PWM along with its advantages. 6

   b) Encode the following binary data stream into Bipolar RZ, NRZ (On-Off) and Manchester codes.

   Data Stream : 11100101 6

   c) Explain the sampling theorem. Comment on the effect of sampling frequency on reconstruction of the signal. 4

OR

4. a) Explain meaning of crosstalk and intersymbol interference. What are their causes and how does the eye diagram help their study ? 8

   b) Differentiate between Ideal sampling and Flat top sampling. 4

   c) Using Shannon's Theorem compute the maximum bit rate for a channel having Bandwidth 3100 Hz and signal to noise ratio 20 dB. 4

5. a) What is the significance of Quantization in A/D Conversion ? What is Uniform Quantization ? What is the drawback associated with it and how to overcome this drawback ? 10

   b) A signal m (t) of Bandwidth B = 4 KHz is transmitted using a binary companded PCM with μ=100. Compare the case of L = 64 with the case of L = 256 from the point of view of transmission bandwidth and the output SNR. 6

OR

6. a) Explain in detail differential pulse code modulation system. Draw diagram for DPCM transmitter and receiver. What are its advantages over PCM ? 10

   b) Draw and explain schematic diagram of T1 carrier system. What is the Data rate supported ? 6

SECTION – 2

7. a) Describe the following terms :

   i) Hamming weight of a code word

   ii) Hamming distance

   iii) Code efficiency

   iv) Entropy and Information rate. 8

   b) A 7 bit hamming code is received as 1110101. What is the correct code ? 4

   c) Define the terms Bit Error Rate (BER) and Character Error Rate (CER). 4

OR

8. a) What is ARQ ? Explain in short Go back n mechanism. What are its drawback ? **8**

   b) What is CRC ? Compute the polynomial checksum for a Frame 1101011011 using the generator $G(x) = x^4 + x + 1$. **8**

9. a) Comment on the significance of the various channels used in ISDN. Also specify the data rate supported by these channels. **6**

   b) How many voice channels are supported by the following Digital transmission Standards DS0, DS1, DS2 ? **6**

   c) Draw and explain the Basic SONET Frame structure. **6**

OR

10. a) Write a short note on Frame Relay Technology. **6**

    b) Draw and explain the ATM protocol Stack. Comment on the significance of AAL Layer. **6**

    c) Explain the terms Dedicated Circuit and Switched Circuit along with their key characteristics. **6**

11. a) Comment on the TCP/IP protocol Stack. How it is different than OSI 7 layer Model ? **8**

    b) Explain in short various physical topologies. Which topology is widely used today and why ? **8**

OR

12. a) Differentiate between Circuit Switching and Packet Switching. **4**

    b) An organization is required to setup a network of 25 PCs. Comment on the various components required. Which physical medium is suitable ? Also draw the topology of this network. **6**

    c) Comment on the various categories of Unshielded Twisted pair cable along with data rates supported. **6**
