

Total No. of Questions : 10] [Total No. of Printed Pages : 4

Roll No.

CS/EE/IT/BM-405(N)

B. E. (Fourth Semester) EXAMINATION, June, 2010

(New Scheme)

(Common for CS, EE, IT & BM Engg. Branch)

ANALOG AND DIGITAL COMMUNICATION

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt any *five* questions taking *one* question from each Unit. All questions carry equal marks.

Unit – I

1. (a) Find the Fourier transform of a single-side exponential function $e^{-bt} u(t)$. Also draw the spectrum, where $u(t)$ is unit step function. 10
- (b) State and prove Parseval's theorem for energy signal and power signals. 10

Or

2. (a) Explain the following properties of Fourier transform : 10
 - (i) Time Scaling
 - (ii) Duality (Symmetry)
 - (iii) Linearity (Superposition)
 - (iv) Frequency Shifting

- (b) Calculate the signal energy for the signal expressed as under : 10

$$X(t) = e^{-7t} u(t)$$

$$\text{where } u(t) = \begin{cases} 1 & \text{for } t > 0 \\ 0 & \text{for } t < 0 \end{cases}$$

Unit-II

3. (a) An amplitude modulated wave

$$10 [1 + 0.6 \cos 2\pi \cdot 10^3 \cdot t] \cos 2\pi \cdot 10^6 t$$

is to be detected by a linear diode detector. Then calculate : 10

(i) Time constant (τ).

(ii) The value of resistance R if the capacitor used is $100 \mu F$.

- (b) How FM signal can be generated with PM signal ? Discuss in detail. 10

Or

4. (a) When the modulating frequencies in an FM system is 400 Hz and the modulating voltage is 2.4 V, the modulation index is 60. Then calculate : 10

(i) Maximum deviation.

(ii) What is the modulation index when the modulating frequency is reduced to 250 Hz and modulating voltage is simultaneously raised to 3.2 V.

- (b) Prove that after amplitude modulation, the carrier power increases from P_c to $P_c \left(1 + \frac{m_a^2}{2}\right)$ where, m_a is

Unit – III

5. (a) State and explain Sampling theorem with flat-top sampling technique. 10
- (b) A PCM system uses a uniform quantizer followed by a ν bit encoder. Show that r. m. s. signal to quantization noise ratio is approximately given as $(1.8 + 6\nu)$ dB. 10

Or

6. (a) Write comparison between PCM, Delta modulation, adaptive delta modulation and differential pulse code modulation. 10
- (b) A television signal having a bandwidth of 4.2 MHz is transmitted using binary PCM system. Given that the number of quantization levels is 512. Determine : 10
- (i) Code word length
 - (ii) Transmission bandwidth
 - (iii) Final bit rate

Unit – IV

7. (a) Explain the concept of BPSK in detail. 10
- (b) Explain the ASK system and derive the relation for error probability of binary ASK. 10

Or

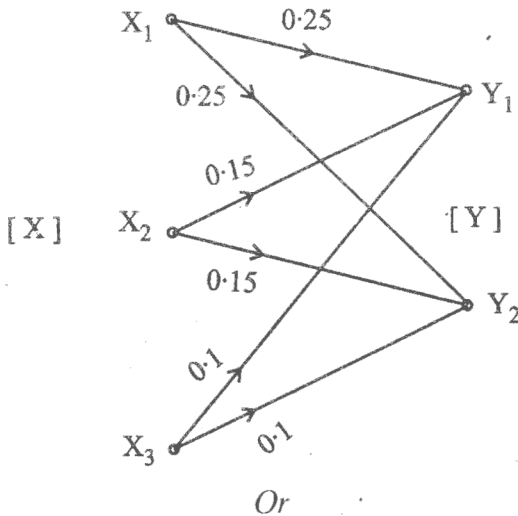
8. (a) In a digital CW communication system, the bit rate of HRZ data stream is 1 Mbps and carrier frequency of transmission is 100 MHz. Determine the symbol rate of transmission and bandwidth requirement of channel for different techniques : 10
- (i) QPSK system
 - (ii) BPSK system
 - (iii) 16-Ary PSK system

- (b) Compare the various digital modulation techniques. 10

[4]

Unit - V

9. (a) Encode the following by Huffman coding method for $M = 4$. Calculate the coding efficiency : 10
[X] = [X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8]
[P (X)] = [0.2 0.2 0.15 0.15 0.1 0.1 0.05 0.05]
- (b) Calculate the mutual information for the channel shown in fig. 10



10. (a) State Shannon-Hartley theorem for capacity of a Gaussian channel : 10
i. e. $C = w \log \left[1 + \frac{S}{N} \right]$ bits/sec.
- (b) Write short notes on any two of the following : 10
- (i) Block codes
 - (ii) Error-control codes
 - (iii) Cyclic code
 - (iv) Line coding