

Total No. of Questions : 10] [Total No. of Printed Pages : 3

Roll No.

CS/EE/IT/BM-405

B. E. (Fourth Semester) EXAMINATION, June, 2012

(Grading/Non-Grading)

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

ANALOG AND DIGITAL COMMUNICATION

Time : Three Hours

Maximum Marks : $\begin{cases} GS : 70 \\ NGS : 100 \end{cases}$

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

Unit – I

1. (a) Find the Fourier transform of a unit step function.
(b) State and prove the following properties of Fourier transform :
 - (i) time shifting property
 - (ii) frequency shifting property

Or

2. (a) State and prove Parseval's theorem for energy signals.
(b) Explain and differentiate between convolution, correlation and autocorrelation.

Unit – II

3. (a) A single tone modulating signal $e_m = E_m \cos \omega_m t$ amplitude modulates a carrier $e_c = E_c \cos \omega_c t$:
 - (i) Derive an expression for AM wave $e(t)$.
 - (ii) Derive an expression for modulation index.

P. T. O.

- (b) Explain synchronous detection technique for the detection of SSB-SC signal. Also discuss the effect and cause of phase and frequency errors.

Or

4. (a) Find an expression for the FM wave and a narrowband FM for a single tone frequency modulation when carrier $A \cos \omega_c t$ is frequency modulated by a single tone modulating signal $f(t) = E_m \cos \omega_m t$.
- (b) Discuss the effect of variation in m_f on the spectrum of FM wave. Also explain NBFM and WBFM.

Unit-III

5. (a) Explain natural and flat top sampling. Compare the two. Also describe aperture effect.
- (b) Explain how PPM and PWM signals are generated from :
- (i) PAM signals
 - (ii) directly

Or

6. (a) Explain quantization. What is quantization error ? How does it depend upon the step size ? Explain.
- (b) Describe delta modulation. What are its limitations ? How are they overcome ?

Unit-IV

7. (a) Describe generation and detection of BFSK.
- (b) Explain PSK and DPSK and compare the two.

Or

8. (a) Explain generation, detection, bandwidth of Quadrature Amplitude Modulation (QAM).

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(b) Compare in detail all digital modulation techniques.

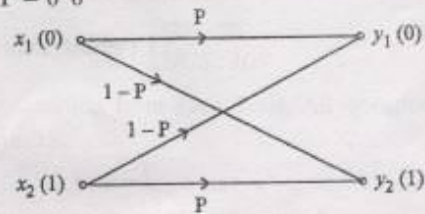
Unit – V

9. (a) Explain Entropy, Mutual Information, Noise Free Channel, Binary Symmetric Channel and Binary Erasure Channel (BEC).

(b) For the BSC shown in figure below find the channel capacity for :

(i) $P = 0.9$

(ii) $P = 0.6$



Or

10. (a) Apply the Shannon-Fano coding procedure for the following message ensemble and find the coding efficiency :

$[X] = [x_1 \ x_2 \ x_3 \ x_4 \ x_5 \ x_6 \ x_7]$

$[P] = [0.4 \ 0.2 \ 0.12 \ 0.08 \ 0.08 \ 0.08 \ 0.04]$

(b) What is coding efficiency ? Show that the coding efficiency is maximum when $P(0) = P(1)$.

