* R M - 7 0 8 7 / 8 0 0 *

RM-7087

B. E. - III (Sem. VI) (EC//IC) Examination

May / June – 2010

EC-604 : Analog & Digital Communication

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ B. E. - 3 (Sem. 6) (EC//IC)

Name of the Subject :

☛ EC-604 : Analog & Digital Communication

☛ Subject Code No. : 7 0 8 7 ☛ Section No. (1, 2,.....) : 1&2

Seat No. :

Student's Signature

(2) Assume suitable data whenever necessary and clearly mention them.

(3) Accronyms and symbols carry their usual meaning.

(4) Figures to the right indicate full marks.

(5) Use of programmable calculations not allowed.

(6) All symbols and abbreviation carry usual meanings.

(7) Attempt all questions.

SECTION - I

1 (a) Do as directed **10**

- Answer all the questions in brief
- All questions carry equal marks.

(i) The Fourier transform $F\left(e^{-t}\cdot u(t)\right)$ is equal to $\frac{1}{1+j^2\pi f}$ Find $F\left(\frac{1}{1+j2\pi t}\right)$.

(ii) Find the inverse Fourier transform of $\delta(w-w_0)$

(iii) For equal Bandwidth FM and PM prove that $Kf = Kp\cdot Wm$.

(iv) Discuss "Bandwidth of narrow band FM (NBFM) is equal to AM."

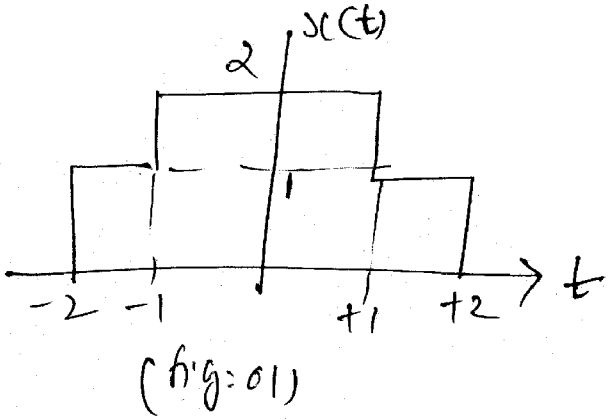
(v) Compare synchronous and asynchonous detection methods for AM.

(b) (i) State time convolution theorem. 1

(ii) Give application of time convolution.

(iii) Prove time convolution theorem. 3

(c) Determine the Fourier transform of the following figure in hyperbolic trigonomatric function. 5



(fig: 01)

2 (a) Explain with necessary diagram and equations balanced modulator ckt for generation of DSBSC. 8

(b) Derive an expression for the signal $V_3(t)$ for figure 2 given parameters as : 7

$V_1(t) = 10\cos(2000\pi t) + 4\sin(200\pi t)$

Assume $V_2(t) = aV_1(t) + bV_1^2(t)$ where a, b are constants having values 0.1 respectively. BPF is an ideal unit gain filter with passband from 800 H(z) to 1200 H(z).

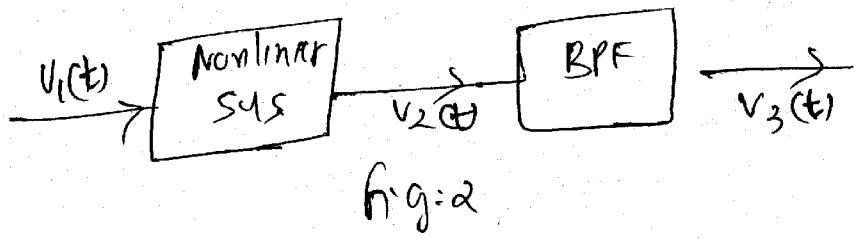


fig: 2

OR

2 (a) Describe QAM system transmitter and receiver with necessary diagrams and equations. 8

(b) Show that if every frequency component of a signal $x(t)$ is shifted by an amount $\pi/2$ then the resultant signal $x_h(t)$ is Hilbert transform of $x(t)$. i.e. Prove that 7

$$x_h(t) = \frac{1}{\pi}\int_{-\infty}^{\infty}\frac{x(y)}{t-y}\,dy.$$

3 (a) Starting with the phasor form of FM wave derive the expression for the single tone Narrow-band FM. **7**

(b) (i) Find the instantaneous frequency in hertz of each of the following signal. **4**

$$f(t) = \cos 200\pi t \cdot \cos(5\sin 2\pi t) + \sin\ 200\pi\ \sin\ (5\sin\ 2\pi t)$$

(ii) Given an angle modulated signal **4**

$$x_c(t) = 10\ \cos\left(\left(10^8\right)\pi + 5\ \sin 2\pi\left(10^3\right)t\right)$$

Determine the maximum phase and frequency deviations.

OR

3 (a) Explain with necessary details foster seeley detector ckt for FM demodulation. **8**

(b) Given an angle modulated signal **7**

$$x_c(t) = 10\cos\ (W_c t + 3\ \sin\ W_m t)$$

Assume FM and fm = 1 kHz. Calculate the modulation index and find the B.W. when (i) fm is doubled (ii) fm is decreased by one third.

SECTION - II

4 Answer the following questions in brief. Each question carries equal marks. **20**

(i) What is aliasing and how it is reduced?

(ii) The information in an analog waveform with maximum frequency fm = 3 kHz is to be transmitted over an M-level PCM system where the number of quantization levels is M=16. The quantization distortion is specified not to exceed 1% of peak to peak analog signal.

(a) What would be the maximum number of bits per sample that should be used in this PCM system?

(b) What is the minimum sampling rate and what is the resulting bit transmission rate?

(iii) Draw the unipolar NRz, polar NRz bipolar NRz and polar quaternary NRz signals (PAM) for 10110100 Line code.

(iv) Explain the difference between apsk and bpsk modulation system.

(v) Explain the concept of information and information rate.

5 (a) What is sampling? Explain the flat top sampling in detail. 8

(b) Derive an expression for signal to quantization noise ratio for a PCM system which employs linear quantization technique. Given that input to the PCM system is a sinusoidal signal. 7

OR

5 (a) Explain the Delta Modulations. What are its advantages and disadvantages? 8

(b) Find the Nyquist rate and the Nyquist interval for the signal. 7

$$x(t) = \frac{1}{2\pi}\cos(400\ \pi t)\cos(1000\pi t)$$

6 Answer the following : (any **three**) **15**

(i) A discrete source emits one or five symbols once every millisecond with probabilities 1/2, 1/4, 1/8, 1/16 and 1/16 respectively. Determine the source entropy and information rate.

(ii) Verify the following expression

$$H(x, y) = H(x/y) + H(y)$$

(iii) With help of block diagram exlain a PAM/TDM system.

(iv) Explain T-1 carrier system in detail.

(v) What is line coding? Explain the various properties of line coding.