

2015

M.Sc.

3rd Semester Examination

ELECTRONICS

PAPER—ELC-303

Full Marks : 50

Time : 2 hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

(Communication Engineering)

Answer Q. No. 1 and any *three* questions from the rest.

1. (a) Write down the differences between DPCM and delta modulation.
- (b) Discuss how PLL can be used to demodulate FM signals.
- (c) Write down the basic conditions for distortionless transmission.

(Turn Over)

- (d) In a VSB amplitude modulation system, prove that

$$H_o(F) = \frac{1}{H_i(f+fc) + H_i(f-fc)} \quad |f| \leq B$$

where the symbols have their usual meanings.

- (e) Prove that for a LTI system

$$Y|f| = H(f). X(f)$$

where $y(f)$ is the output of the system, $h(t)$ is the impulse response of the system and $x(t)$ is input excitation.

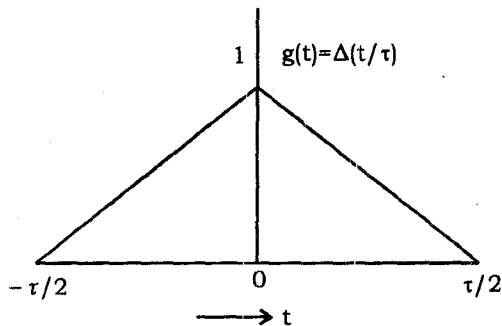
2. (a) Show that the Fourier transform of $e^{-a|t|}$ is equal to

$$\frac{2a}{a^2 + (2\pi f)^2}$$

- (b) If $G(f)$ is the Fourier transform of the signal $g(t)$, prove that

$$\int_{-\alpha}^{\alpha} g(\tau) d\tau \leftrightarrow \frac{G(F)}{i2\pi f} + \frac{1}{2} G(0) \delta(f)$$

- (c) Using time-differentiation property, find the Fourier transform of the triangular pulse $D(t/\tau)$ as shown below :



3+3+4

3. (a) With a neat sketch, discuss the principle of operation of a ring-modulator to generate DSB-SC signal.
- (b) Discuss the operating principle of switching demodulator and coherent demodulator.
- (c) Discuss the principle of operation of Phase-shift method to generate SSB signals.

3+(2+2)+3

4. (a) An angle modulated signal with carrier frequency $\omega_c = 2\pi \times 10^5$ is described by the equation :

$$\phi_{EM}(t) = 10 \cos(\omega_c t + 5 \sin 3000t + 10 \sin 2000\pi t)$$

Find the power of the modulated signal, frequency deviation ΔF and deviation ratio β .

- (b) Discuss the Indirect method of NBFM generation.
- (c) What do you mean by monophonic FM receiver ? Why pre-emphasis and de-emphasis filters are needed in FM broadcasting system ?

3+3+(2+2)

5. (a) State and prove the Sampling theorem.
- (b) Derive the interpolation formula :

$$g(t) = \sum_K g(kTs) \operatorname{sinc}(2\pi\beta t - k\pi)$$

- (c) Find a signal $g(t)$ that is band limited to BH_z and whose samples are

$$g(0) = 1 \text{ and } g(\pm Ts) = g(\pm 2Ts) = g(\pm 3Ts) = \dots = 0$$

where the sampling interval T_s is the Nyquist interval for $g(t)$.

4+4+2

6. (a) Discuss some basic advantages of digital communication over analog communication system.
- (b) What is quantization noise? Prove that for a PCM System

$$\frac{S_0}{N_0} = 3L^2 \frac{\overline{m^2(t)}}{m_p^2}$$

where L is the number of quantization levels, S_0/N_0 is the signal to noise ratio, $\overline{m^2(t)}$ is the message signal and m_p is the peak amplitude value that a quantizer can accept.

- (c) What is the function of Compandor in a PCM System?

[Internal Assessment — 10]
