M.Sc. 3rd Semester Examination, 2013

ELECTRONICS

(Communication Engineering)

[Theory]

PAPER — ELC-303

Full Marks : 50

Time : 2 hours

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

The figures in the right hand margin indicate marks

1. (*a*) Write down the differences between digit interleaving and word interleaving.

   (*b*) Discuss the functions of compandor in PCM communication.

(2)

(c) Explain, why pre-emphasis and de-emphasis is needed in FM communication system ?

(d) Discuss the functions of RF amplifier in super Heterodyne AM receiver.

(e) Prove that

$$\frac{dg(t)}{dt} \Leftrightarrow j2\pi f\, G(f),$$

where $G(f)$ is the Fourier transform of $g(t)$. 2×5

2. (a) If 'x' input is applied to a system 'h' showing output 'y', then determine the transfer function $H(f)$ of the system for distortionless condition.

(b) If $g(t) \Leftrightarrow G(f)$, then show that

$$\int_{-\alpha}^{t} g(\tau)d\tau \Leftrightarrow \frac{G(f)}{j2\pi f} + \frac{1}{2}G(0)\delta(f). \quad 5+5$$

3. (a) With proper circuit diagram discuss how DSB-SC AM waves are generated using ring-modulator.

(b) Discuss the phase-shift method with proper block diagram to generate SSB-SC AM wave.

(c) Prove that

$$H_0(f) = \frac{1}{H_i(f+f_i) + H_i(f-f_i)}$$

when $|f| \le B$. Where $H_0(f)$ is the transfer function for lowpass filter at the receiver of the VSB signal and $H_i(f)$ is that for the band pass filter at the transmitting and of the VSB signal.   4 + 3 + 3

4. (a) Discuss with proper circuit diagram the method of NBFM generation.

(b) An angle modulated signal with carrier frequency $\omega_c = 2\pi \times 10^5$ Rad/sec is described by the equation :

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

Find frequency deviation Δf and deviation ratio β.

(4)

(c) What do you mean by monophonic FM receiver ? 4 + 4 + 2

5. (a) Show that FM wave is more immune to noise generated from system non-linearity compared to AM waves.

(b) State and prove the sampling theorem.

(c) Write down the interpolation formula for re-construction of message signal $g(t)$.

4 + 4 + 2

6. (a) Calculate the capacity of a standard 4 kHz telephone channel with 32 dB, SNR.

(b) Discuss briefly how PAM wave can be generated using an AND gate.

(c) How can you generate PPM signal from PWM signal ?

(d) Discuss the modulation and demodulation techniques of delta-modulation. 2 + 2 + 3 + 3

[*Internal Assessment* — 10 Marks]