PG/IIIS/ELC-302/18

M.Sc. 3rd Semester Examination, 2018

ELECTRONICS

(*Communication Systems*)

PAPER – ELC-302

Full Marks : 50

Time : 2 hours

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

The figures in the right hand margin indicate marks

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

Illustrate the answers wherever necessary

1. Answer the followings : 2 × 5

   (*a*) Write down the differences between NRZ and RZ signal formats.

(*b*) Write down the advantages of PCM over other analog or digital modulation systems.

(*c*) What is the need of pre-emphasis and deemphasis filters in FM broadcasting ?

(*d*) Write down the conditions of distortionless transmission for a LTI system.

(*e*) What do you mean by coherent detection in connection with AM demodulation ?

2. (*a*) With a neat sketch draw the circuit diagram of a ring modulator to generate DSB-SC AM signal and discuss its principle of operation.

(*b*) Determine power efficiency η and percentage of the total power carried by the side bands of the AM wave for tone modulation when $\mu = 0.5$ and $\mu = 0.3$, where μ is the modulation index.

(*c*) Discuss how AM waves can be demodulated using envelope detectors. 4 + 3 + 3

3. (*a*) An angle-modulated signal with carrier frequency $\omega_c = 2\pi \times 10^5$ is describe 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 of, deviation ratio β, phase deviation $\Delta\phi$ and estimate the band width of $\phi_{Em}(t)$

(*b*) Discuss with proper block diagram Armstrong method of Indirect FM generation. (1 + 1 + 1 + 1 + 1) + 5

4. (*a*) Write down the function of bandpass limitter in connection with NBFM generation.

(*b*) State and prove the Nyquist sampling theorem.

(*c*) Find a signal $g(t)$ that is band limited to BHz and whose samples are $g(0) = 1, g\ g(\pm nts) = 0$, where the sampling interval T_s is the Nyquist interval for $g(t)$. 3 + 5 + 2

5. (*a*) What do you mean by companding in PCM system ? Write down the μ Law and *A* Law.

(*b*) A signal $m(t)$ band limitted to 3 kHz is sampled at a rate $33\frac{1}{3}\%$ higher than the Nyquist rate. The maximum acceptable error in the sample amplitude is 0·5% of the peak amplitude, mp. The quantized samples are binary coded. Find the minimum bandwidth of a channel required to transmit the encoded binary signal.

(*c*) A signal $m(t)$ of bandwidth $B = 4$ kHz is transmitted using a binary companded PCM with $\mu = 100$. Compare the case of $L = 64$ with the case of $L = 256$ from the point of view of transmission bandwidth and output SNR. (2 + 2) + 3 + 3

6. (*a*) With a suitable circuit diagram discuss how you can generate PWM signal using a monostage multivibrator.

(*b*) **Write down the differences between differential PCM and delta modulation.**

(*c*) **Write a short note on FSK.** 4 + 3 + 3

[*Internal Assessment* : 10 Marks]
