2008

M.Sc.

3rd Semester Examination

ELECTRONICS

PAPER—EL-2103

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.

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

1. a) What is the modulation index in FM? Mention its significance.

b) Draw the basic block diagram for generation of SSB-SC signal.

c) What is quadrature null effect?

d) What are Nyquist rate and Nyquist interval?

e) What do you mean by recursive and non-recursive systems? 2×5

2. a) Why modulation is necessary?

b) With the help of block diagram, describe the QAM process.

c) Given Phase-modulated (PM) signal

$x_c(t) = 10 \cos(w_c t + 3 \sin w_m t)$

and message signal frequency (f_m) is 1 KHZ.

Calculate the modulation index and find the bandwidth when f_m is double. $2+5+(1\frac{1}{2}+1\frac{1}{2})$

3. a) A band limited signal m(t) is sampled by a train of rectangular pulses of width τ and period T.

(i) Find an expression for the sampled signal.

(ii) Determine the spectrum of the sampled signal and sketch it.

b) Explain the principle of Binary phase shift keying (BPSK). 4+3+3

4. a) What is quantization error?

b) Derive an expression for signal to raise ratio in PCM system that uses Linear quantization.

c) A binary channel with bit rate r_b = 36000 bits per second is available for PCM transmission. Evaluate the appropriate values of the sampling rate, the quantizing level and the number of binary digits. (Assume message signal frequency 3.2 KHz.)

2+5+(1+1+1)

5. a) What do you mean by time-invariant and time-variant systems?

b) Determine if the following system is time-invariant or time-variant?

$$y(n) = n\, x(n)$$

c) A LTI system is characterized by the system function:

$$H(Z) = \frac{Z}{2Z^2 - 3Z + 1}$$

Specify the ROC of H(Z) and determine h(n) for the following condition :

(i) The system is stable.

(ii) The system is casual. 2+2+(3+3)

6. Write short notes on any *two* of the following : 5×2

i) Envelope detector.

ii) Armstrong method of FM Generation.

iii) Super-heterodyne receiver.

Internal Assessment — 10