53 (EC 402) ANCM

2018

ANALOG COMMUNICATION

Paper : EC 402

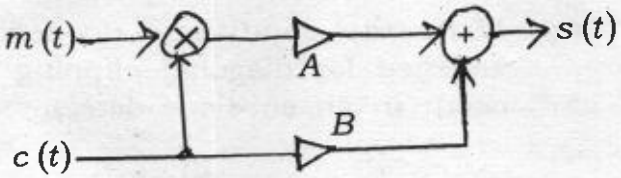
Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer ***any five*** *questions.*

1. *(a)* The *figure* shown below is a scheme for the generation of a conventional AM signal. Choose $m(t) = \cos\left(2\pi 10^3 t\right)$ and $c(t) = \cos\left(2\pi 10^6 t\right)$.



(i) Obtain an expression for the modulation index of the AM signal.

(ii) For a modulation index of 90% and PEP (normalised across 1Ω) of $100\,W$, find the value of amplifier gains A and B. 5+5

(b) What is meant by modulation index of an amplitude modulated system ? How can you differentiate a DSB-SC and a DSB-FC signal in time domain ? Show that it is not possible to amplitude modulate by adding the message signal to the carrier. 2+2+6

2. (a) Derive the condition on the filter transfer function necessary to demodulate a VSB signal. Draw the filter transfer function. 10

(b) Describe the filter method for the generation of SSB-SC signal. 10

3. (a) Write the conditions needed to be satisfied for diagonal clipping not to occur in an envelope detector. Hence prove that $C.R_L \leq \frac{\sqrt{1-m^2}}{W_m \times m}$;

Where the symbols have their usual meaning. 10

(b) Describe the theory behind ring modulator circuit. Why the carrier component cannot produce an output voltage in absence of modulating signal? 10

4. (a) Discuss the generation of WBFM using a reactance modulator circuit. 10

(b) Explain the working principle of a Foster seeley discriminator circuit. 10

5. (a) Show that a linearised PLL can demodulate an FM signal. What is linearisation of a PLL? 8+2

(b) Prove that a narrowband PM (Phase modulation) is similar to AM signal. 10

6. Write short notes on ***any two*** from the following: 10+10

(i) Relation between rise-time and bandwidth for a first-order system.

(ii) Direct a Armstrong method for generation of WB angle modulated signal.

(iii) Figure of merit for an AM system with envelope detector.

(iv) Carson's rule for FM bandwidth.
