



(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 3006

Roll No.

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B. Tech.

(SEM. V) EXAMINATION, 2007-08

ANALOG COMMUNICATION SYSTEMS

Time : 2 Hours]

[Total Marks : 50

Note : Attempt all the questions.

1 Attempt any **one** of the following questions :

- (a) What are the fundamental limitations of the radio communication systems ? How can modulation techniques help in overcoming the above limitations ? 2+2
- (b) Define the following terms : 2+2
- (i) Equivalent noise temperature of a system
- (ii) Noise figure.

2 Attempt any **two** of the following questions :

- (a) Singal $m(t) = A \sin c(2Wt)$ is amplitude modulated by a carrier signal 7
- $c(t) = A_c \cos(2\pi f_c t)$, where A, A_c, W and

f_c are constants. If k_a is the sensitivity of the modulator, find an expression for frequency spectrum of the modulated signal. Also determine the transmission bandwidth of the modulated signal. What do you understand by the transmission efficiency of an AM transmitter ?

- (b) A 300 watts carrier is simultaneously modulated by three single-tone audio signals with percentage modulations of 50, 70 and 40 respectively. Determine the total power of the resultant modulated signal. Derive the formula used for your calculation. 7
- (c) Describe briefly the operation of a coherent detector for the demodulation of DSB-SC signals. Describe the limitations of this detection method. What do you mean by the *quadrature null effect* ? 4+2+1

3 Attempt any **three** of the following questions :

- (a) Describe briefly the operation of a balanced frequency discriminator for the demodulation of FM signals. 6
- (b) Compare the phasor diagrams of a narrowband FM and an AM signal. Show that the transmission bandwidth of a narrowband FM signal is the same as that of an AM signal. 3+3

- (c) The sinusoidal modulating wave 6
 $m(t) = A_m \cos(2\pi f_m t)$ is applied to a phase modulator with phase sensitivity k_p . The unmodulated carrier wave has frequency f_c and amplitude A_c . Construct a phasor diagram for this modulated signal, and compare it with that of the corresponding narrowband FM signal.
- (d) Consider a narrowband FM signal 3+3
 approximately defined by
 $s(t) \approx A_c \cos(2\pi f_c t) - \beta A_c \sin(2\pi f_c t) \sin(2\pi f_m t)$
 where f_c and A_c are the frequency and amplitude of the unmodulated carrier signal; β is the modulation factor; and f_m is the frequency of the modulating signal. Determine the envelope of the above signal. What is the ratio of the maximum to the minimum value of this envelope ?
- (e) Describe the generation of an FM signal 6
 using a voltage controlled oscillator.

4 Attempt any **two** of the following questions :

- (a) Define the input and output signal to 2+2+3
 noise ratios (SNRs) of a radio detector circuit. What do you mean by the *figure of merit* of a receiver circuit ? Why is a band pass filter normally employed at the front-end of any receiver circuit ?

- (b) Derive an expression for the figure of merit of an AM detector. 7
- (c) Describe briefly the functions of the Pre-Emphasis and De-Emphasis in FM systems. 7
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