

Roll No. ....

Total Pages : 3

BT-3/D-18

33090

ANALOG COMMUNICATION

Paper : ECE-209(N)

Opt. (I)

Time : Three Hours]

[Maximum Marks : 75

**Note :** There are total *eight* questions. Each question carries equal marks. The candidate is required to attempt *five* questions in all, selecting atleast *one* question from each unit.

**UNIT-I**

1. (a) Define SNR and Noise Figure. Write note on the measurement and calculation of noise figure in a network. 8
- (b) A 12 GHz receiver consists of first stage with gain  $G_1 = 30$  dB and noise temperature  $T_1 = 20$  K, a second stage with gain  $G_2 = 10$  dB and noise temperature  $T_2 = 360$  K and third stage with gain  $G_3 = 15$  dB and the noise temperature  $T_3 = 1000$  K. Calculate the effective noise temperature and noise factor of the system. Take the reference temperature as 290 K. 7
2. (a) Derive the equation for AM wave. A 100 kHz carrier is simultaneously modulated with 300 Hz, 800 Hz and 2 kHz audio sine waves. What will be the frequencies present in the output? 7
- (b) Differentiate between :
  - (i) AM and FM signals.
  - (ii) NBFM and WBFM system. 8

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[P.T.O.  
24/12**UNIT-II**

3. (a) Prove that balanced modulator for AM suppresses the carrier. 7
- (b) With neat diagram explain working of envelope detector. The waveform  $v(t) = (1 + m_a \cos w_m t) \cos w_c t$ , with in a constant ( $m_a \leq 1$ ), is applied to the diode detector. Show that, if the demodulator output is to follow the envelope of  $v(t)$ , it is required at any time to

$$\frac{1}{RC} = \frac{w_m \cdot m_a}{\sqrt{1 - m_a^2}},$$

where  $w_m$  = angular frequency of modulating signal $m_a$  = modulation index. 8

4. (a) With the block diagram, explain the working of a super heterodyne receiver and list their advantages. 8
- (b) What is image frequency problem related with superheterodyne receiver and how it can be removed? Elaborate. http://www.kuonline.in 7

**UNIT-III**

5. (a) With a neat block diagram explain FM transmitter using indirect method. 8
- (b) Given FM and PM modulators with the following parameters : Deviation sensitivity as 1.2 kHz/v and 1.2 rad/volt respectively. Carrier:  $20 \cos (2\pi \times 10^6 t)$ ; Modulating signal :  $5 \cos (2\pi \times 10^3 t)$  : (i) Determine the modulation index, bandwidth and sketch the output

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spectrum for both modulators, (ii) Half the modulating frequency and determine the modulation index and sketch the output spectrum for both modulators. Assume random value for the Bessel coefficients. 7

6. (a) Draw the circuit diagram of a ratio detector and explain its operation. How is amplitude limiting obtained in this detector? 8
- (b) Why pre-emphasis and de-emphasis are used in FM? Draw the circuit diagrams and the characteristics of pre-emphasis and de-emphasis circuits. 7

#### UNIT-IV

7. (a) With neat diagram explain the weaver's method for SSB generation. State the advantages and disadvantages of this method. 8
- (b) Explain with the help of wave forms modulation and demodulation of independent side band system. 7
8. (a) Explain the operation of SSB Pilot Carrier receiver with necessary block diagram. 7
- (b) Draw and explain the generation and demodulation of PWM with its waveform. State the advantages of PWM over PAM. 8

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