

Name :

Roll No. :

Invigilator's Signature :

**CS/B.Tech(EIE)/SEM-5/EC-511(EI)/2010-11
2010-11**

ANALOG COMMUNICATION THEORY

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

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

GROUP - A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ten of the following :

10 × 1 = 10

- i) The amplitude of sideband in a AM wave is
 - a) independent of carrier amplitude
 - b) independent of modulation index
 - c) $0.5 \times \text{carrier amplitude} \times \text{modulation index}$
 - d) $\text{carrier amplitude} \times \text{modulation index}$.
- ii) In an FM wave, the sidebands are spaced at intervals equal to
 - a) twice the modulating frequency
 - b) half the modulating frequency
 - c) equal to the modulating frequency
 - d) greater than modulating frequency.

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- iii) In a radio receiver
- all stages contribute equally
 - RF stage has no effect on S/N ratio to noise
 - mixer stage contributes most of the noise generated
 - detector stage contributes most of the noise.
- iv) The purpose of a balanced modulator is to eliminate
- the carrier
 - upper sideband
 - lower sideband
 - basenabbed signal.
- v) In frequency modulation, if the amplitude of the modulating voltage is doubled, the maximum frequency deviation
- doubles
 - becomes four times
 - becomes half
 - remains unaltered.
- vi) Signal at the output of an AM modulator is given by $e = 5.3 (1 + 0.64 \sin 6280 t) \sin 10^6 t$. The modulating frequency is
- 6.28 kHz
 - 1 kHz
 - 1000 kHz
 - indeterminate from the given data.
- vii) The auto-correlatin function $R_x (T)$ satisfies which of the following properties ?
- $R_x (T) = - R_x (T)$
 - $R_x (T) = R_x (- T)$
 - $R_x (T) \geq R_x (0)$
 - $R_x (T) \geq 1$.
- viii) The ratio $(S/N)_{WBFM} / (S/N)_{AM}$ for 100% amplitude modulation with identical total transmitted power (mf = modulation index of FM) is
- $\left(\frac{9}{2} \right) m^2 f$
 - $\left(\frac{3}{2} \right) m^2 f$
 - $\left(\frac{9}{2} \right) m^3 f$
 - $\left(\frac{3}{2} \right) m^3 f$.

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- ix) The pre-emphasis circuit is used for FM in
 a) transmitter b) receiver
 c) detector d) none of these.
- x) The auto-correlation function of an energy signal has
 a) no symmetry b) odd symmetry
 c) even symmetry d) none of these.
- xi) QAM modulation needs a phase shifter of phase shift
 a) $\frac{\pi}{6}$ b) $\frac{\pi}{4}$
 c) $\frac{\pi}{3}$ d) $\frac{\pi}{2}$.
- xii) Once locked the PLL track the incoming frequency over a finite range of frequency shift called
 a) lock range b) capture range
 c) null range d) none of these.

GROUP - B**(Short Answer Type Questions)**Answer any *three* of the following. $3 \times 5 = 15$

2. Write down the threshold effect in an envelope detector. Calculate the input and output signal power in SSB-SC system.
3. a) Find the per cent modulation of an AM wave whose total power content is 2500 W and whose each sideband contains 400 W.
 b) Calculate the % power saving in SSB scheme when 50% modulation is used compared to AM transmission.
4. Write down the advantages and disadvantages of SSB system over DSB system.
5. Define the terms "sensitivity", "selectivity" and "fidelity" of a receiver. What are the drawbacks of a TRF receiver ?
6. Draw the modulator and demodulator circuits (block diagram only) for quadrature amplitude modulation. Why is it called bandwidth conservation scheme ?

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GROUP - C**(Long Answer Type Questions)**Answer any *three* of the following. $3 \times 15 = 45$

7.
 - a) Explain the conditions for distortionless transmissions of signals through networks.
 - b) Define amplitude and phase distortion. State the effect of these distortions on signals.
8.
 - a) Draw and explain the phase-shift method for SSB generation.
 - b) Draw the circuit of a square law modulator. Why are they called so ?
 - c) Draw and explain the operation of an envelope detector circuit.
9.
 - a) Find out a relation between PM and FM. How can one be obtained from the other ?
 - b) The bandwidth of FM is infinite. Justify.
 - c) What is Carson's rule ?
10.
 - a) What are the different sources of noise in a communication system ?
 - b) Define noise figure and noise bandwidth ?
 - c) Obtain the expression for SNR in a DSB-SC carrier AM system ?
11. Write short notes on any *three* of the following : 3×5
 - a) Automatic gain control
 - b) VSB modulation and demodulation
 - c) Phase and frequency modulation
 - d) Envelope detector
 - e) Distortionless condition for a transmission line.