

Name :

Roll No. :

Invigilator's Signature :

CS/B.Tech (ECE)/SEM-4/EC-403/2010

2010

ANALOG COMMUNICATION

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 :

$10 \times 1 = 10$

i) In FM sound broadcasting system, the maximum frequency deviation is usually

- | | |
|------------|-------------|
| a) 15 kHz | b) 75 kHz |
| c) 200 kHz | d) 5.2 kHz. |

ii) A superheterodyne receiver with an I.F. of 450 kHz, is tuned to a signal at 1200 kHz. The image frequency is

- | | |
|-------------|--------------|
| a) 750 kHz | b) 900 kHz |
| c) 1650 kHz | d) 2100 kHz. |

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- iii) The Fourier transform of real valued time signal has
- a) odd symmetry
 - b) even symmetry
 - c) conjugate symmetry
 - d) no symmetry.
- iv) The most suitable method for detecting a modulated signal $(2.5 + 5 \cos \omega_m t) \cos \omega_c t$ is
- a) Envelope detector
 - b) Synchronous detector
 - c) Ratio detector
 - d) both (a) and (b).
- v) In a commercial radio receiver, a PLL can be used to demodulate
- a) an AM signal
 - b) a PCM signal
 - c) an FM signal
 - d) a PM signal.
- vi) The main advantage of TDM over FDM is that it
- a) needs less power
 - b) needs less bandwidth
 - c) needs simple circuitry
 - d) gives better SNR.

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- vii) Flat-top sampling leads to
- a) an aperture effect
 - b) aliasing
 - c) loss of signal
 - d) none of these.
- viii) Quantization noise occurs in
- a) PAM
 - b) PWM
 - c) DM
 - d) none of these.
- ix) Companding is used in PCM to
- a) reduce bandwidth
 - b) reduce power
 - c) increase SNR
 - d) get almost uniform SNR.
- x) The aperture effect in flat top pulses is reduced using
- a) Predictor
 - b) Integrator
 - c) Equalizer
 - d) Compander.
- xi) SNR in dB for PCM linear quantization with n as no. of bits is
- a) $n^2 / 12$
 - b) $6 (1 + n)$
 - c) $(6.8 + 4n)$
 - d) $(4.8 + 6n)$.

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xii) IF frequency for FM receiver is

- a) 10.7 MHz b) 12.7 MHz
- c) 13.71 MHz d) 10.3 MHz.

xiii) Zero crossing detectors are used to detect

- a) SSB-SC b) DSB-SC
- c) FM d) none of these.

xiv) An ideal ramp signal is a/an

- a) energy signal
- b) power signal
- c) both of these
- d) none of these.

xv) Bandwidth required for PM is

- a) same as FM signal
- b) greater than FM signal
- c) less than FM signal
- d) less than SSB-SC signal.

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

2. A single tone FM signal is given by

$$e_{FM} = 10 \sin (16\pi \times 10^6 t + 20 \sin 2\pi \times 10^3 t) \text{ volts.}$$

Determine the modulation index modulating frequency, frequency deviation and carrier frequency.

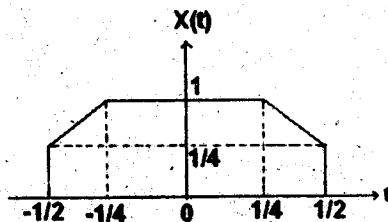
3. Explain the elements of a communication system with suitable block diagram.

4. What is a slope detector ? What are the problems of slope detectors and how is it overcome using a balanced detector ?

 $2 + 3$

5. Explain pre-emphasis and de-emphasis in FM.

6. Determine the Fourier transform of $x(t)$:



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

7. a) What is meant by autocorrelation ? Explain with power expressions. 3
- b) State and prove time convolution theorem. 3
- c) Find the transfer function of a system for distortionless transmission. 3
- d) Given transfer function for a channel with ideal amplitude response and non-ideal phase response :

$$| H (\omega) | = 1$$

$$\theta_h (\omega) = - \omega t_0 - k \sin \omega T \quad k \ll 1$$

Then show that output for an input $g (t)$

$$y (t) = g (t - t_0) + (k/2) [g (t - t_0 - T) - g (t - t_0 + T)]$$

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8. a) What are sensitivity and selectivity of radio receiver ? 3
- b) Explain with proper circuit diagram how DSB-SC signal is obtained using ring modulator. 5
- c) What is meant by synchronous detection of DSB-SC signal ? 2
- d) Discuss the effect of phase and frequency error in synchronous detection. 5

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9. a) Considering a message signal $e_m = E_m \cos W_m t$ and a carrier signal by $e_c = E_c \sin (W_c t + \theta)$, find the expression of the resultant FM wave. 7
- b) Explain FM stereo Tx / Rx system with block schematic diagrams. 8
10. a) Justify how FM can be obtained from PM and vice versa. 8
- b) Describe a method of indirect way of FM generation. 7
11. Write short notes on any *three* of the following : 3 × 5
- a) VSB modulation
 - b) QAM system
 - c) Pre-emphasis and de-emphasis
 - d) S/N of DSB-SC system
 - e) Envelope detector.
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