*Name* : .....

*Roll No.* : .....

*Invigilator's Signature :* .....

**CS/B.Tech (EEE)/SEM-8/EC-802F/2013**

# 2013
# COMMUNICATION ENGINEERING

*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* the following :

$10 \times 1 = 10$

i) Single side band system needs

a) more band width

b) higher power

c) complex receiver circuits, as compared to other type systems

d) none of these.

ii) In commercial FM broadcasting, the maximum frequency deviation is normally

a) 5KHZ b) 15KHZ

c) 75KHZ d) 200KHZ.

iii) The signal to quantization noise ratio in PCM system depends upon

a) sampling rate

b) no. of quantization levels

c) message singal band width

d) none of these.

iv) A super heterodyne receiver with an I.F of 450 KHZ is tuned to a signal at 1200 KHZ. The Image frequency is

a) 750KHZ b) 900KHZ

c) 1650KHZ d) 2100KHZ.

v) Multiplexing technique that transmits analog signal is

a) FDM b) TDM

c) WDM d) both (a) and (b).

vi) The key circuit used in DPSK modulator is

a) NAND GATE b) XOR/XNOR GATE

c) OR GATE d) NOR GATE.

vii) Which one is most affected by noise ?

a) PSK b) ASK

c) FSK d) DPSK.

viii) White noise is specified by

a) Gaussian distribution

b) Rician distribution

c) Binomial distribution

d) Maxwell-Boltzmann distribution.

ix) For video transmission of television, which of the following is used ?

a) AM b) DSB-SC

c) VSB d) SSB-SC.

x) The sharing of medium and its link by two or more devices is called

a) Modulation b) Encoding

c) Line coding d) Multiplexing.

xi) Hamming code is a method of

a) Error detection

b) Error correction

c) Error encapsulation

d) Error detection and correction.

xii) The saving in power in a DSB-SC system modulated at 80 % is

a) Nil b) 80 %

c) 75·76 % d) 50 %.

## GROUP – B

### ( Short Answer Type Questions )

Answer any *three* of the following. $3 \times 5 = 15$

2. In context of communication why is carrier signal required ? What do you mean by modulation ? Describe why modulation is necessary for communication. 1 + 1 + 3

3. State and prove sampling theorem. What is Nyquist rate ? 4 + 1

4. A carrier signal $A_c \cos W_c t$ is amplitude modulated by a message signal $A_m \cos W_m t$, where $A_m < A_c$.

   a) Write down expression for the modulated signal.

   b) Find $W_c$, so that the band-width of the transmitted signal is 1 percent of the carrier frequency $W_c$. 2 + 3

5. Write short note on transponder.

6. Briefly explain direct method of generation of FM. What is the main drawback of this kind of generation ? 4 + 1

## GROUP – C

## ( Long Answer Type Questions )

Answer any *three* of the following. 3 × 15 = 45

7. a) Explain synchronous demodulation technique for DSB-SC signal. If phase and frequency discrepancy occur in the local carrier then which kind of difficulty you will face ? 3 + 2 + 2

   b) Explain the working principle of envelope detector. 4

   c) Determine the power content of the carrier and each of the sidebands for an AM signal with modulation index $\mu = 0{\cdot}6$ and total power of 500 watt. 4

8. a) Draw the block diagram of PCM system and briefly explain each unit. 4

   b) What is companding used in PCM ? Mention μ-law and A-law. 2 + 3

   c) A binary channel with bit rate $r_b$ = 36000 bits per second is available for PCM voice transmission. Assume band width of the voice signal is 3·2KHZ. Find out approximate value of

      i) sampling frequency (fs).

      ii) no. of quantization level (q).

      iii) no. of bit require to represent each level (v).

      2 + 2 + 2

9. a) Briefly explain Binary ASK modulation technique. Draw the wave form of ASK modulated signal. 2 + 2

   b) Explain generation and coherent detection of binary ASK technique. 3 + 3

   c) Draw signal space diagram for binary ASK signal. 2

   d) What are the advantage and disadvantage of DPSK over PSK ? 3

10. a) Explain the term 'selectivity', 'sensitivity', 'fidelity' of a receiver. 5

    b) Draw the block diagram of super heterodyne receiver and explain the function of each block. 6

    c) In a broadcast super heterodyne receiver having no RF amplifier, the loaded quality factor *Q* of the antenna coupling circuit is 455 KHZ. Then, what would be the image frequency and its rejection ratio for tuning at 1100 KHZ station. 4

11. a) Define information and Entropy. 2 + 2

    b) A source produces 4 symbols *P*, *Q*, *R* and *S* with probabilities 1/6, 1/3, 1/4, 1/4. Find entropy of the source. 4

c) What do you meant by channel capacity ? How is it depending on SNR ? 2 + 2

d) Encode the bit sequence 0101101 in the following form :

i) Unipolar NRZ

ii) Bipolar RZ

iii) Manchester 3

12. Write short notes on any three of the following : 3 × 5

a) Delta Modulator

b) Carson's rule

c) Armstrong method for FM generation

d) Modem

e) Transponder

f) FDM