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* of the following : $10 \times 1 = 10$

i) The PCM signal can be generated by amplitude modulating

a) PAM b) PWM

c) PPM d) PDM.

ii) Adaptive delta modulation preferred over delta modulation as

a) it gives better noise performance

b) it uses lesser bits for encoding the signal

c) it does not suffer from slop over load and threshold effect

d) it has simpler circuitry

iii) Entropy is basically measure of

a) Rate of Information

b) Average Information

c) Probability of Information

d) Channel capacity.

iv) A source delivers symbols m_1, m_2, m_3 and m_4 with probability $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$ and $\frac{1}{8}$ respectively. The entropy of the system is

a) 1·7 bits/sec b) 1·75 bits/symbols

c) 1·75 symbols d) 1·75 symbols/bit

v) The main advantage of PCM system is

a) Lower bandwidth b) Lower Power

c) Lower Noise d) None of these.

vi) The highest modulating frequency used in AM broadcast system is

a) 5 kHz b) 10 kHz

c) 15 kHz d) 2 MHz.

vii) Which multiplexing technique transmits analog signal ?

a) FDM b) TDM

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

viii) The bit rate of a digital communication system is 34 Mbps. The modulation scheme is QPSK. The baud rate of the system is

a) 68 Mbps b) 34 Mbps

c) 17 Mbps d) 85 Mbps.

ix) The channel capacity of a 5 kHz bandwidth binary system is

a) 10000 bits/sec b) 5000 bits/sec

c) 8000 bits/sec d) 4000 bits/sec.

x) ..... is most affected by noise.

a) PSK b) ASK

c) FSK d) DPSK.

xi) ISI is

a) Inter Sample Interference

b) Intra sample Interference

c) Inter Symbol Interference

d) Intra Sample Interference.

xii) The step size of Delta Modulation is

a) Continuously changing

b) Discretely changing

c) Increased gradually

d) Fixed.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Given the data stream 1001101. Sketch the transmitted sequence of rectangular pulses for each of the following line codes : 5 × 1

(i) Unipolar NRZ

(ii) Unipolar RZ

(iii) Polar RZ

(iv) Polar NRZ

(v) Bipolar NRZ.

3. Draw the waveform of ASK, PSK and FSK for the input bit sequence 00111011. 1 + 2 + 2

4 Show that in case of AM with modulation index equal to 1, only 33·33% of the transmitted power is used to carry information.

5. a) Considering a sinusoidal modulating signal $m(t)$ and carrier $c(t)$, draw the following waveforms :

   (i) AM signal

   (ii) FM signal.

   b) If the modulation index of AM signal is greater than unity, what problems will be encounted during demodulation ? 2 + 2 + 1

6. What is a PN sequence ? What are the properties of PN sequence ? 2 + 3

GROUP – C

(Long Answer Type Questions)

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

7. a) Derive the general expression for PM and FM wave. Hence comment on the relationship between them.

   b) What is Curson's Bandwidth ?

   c) A 300 W carrier is modulated on a depth of 55%. Calculate the total power in the modulated wave in the following forms of AM.

   (i) DSB with carrier

   (ii) DSB with suppressed carrier. 6 + 2 + 2 + 2 + 3

8. a) State and explain Sampling theorem ?

   b) Explain with a suitable block diagram how an analog signal is converted to digital signal using PCM ?

   c) What are the desirable properties of line codes ?

   d) What are the disadvantages of BPSK and how is it improved ? 4 + 5 + 2 + 4

9. a) What is Inter Symbol Interference (ISI) ?

   b) What is Nyquist criteria for zero ISI ?

   c) Explain Matched Filter.

   d) Compare Bit Rate with Baud Rate.

   e) What is Shannon's limit ? 4 + 3 + 3 + 3 + 2

10. a) Define source entropy and information rate. Write down the Shannon's theorem.

b) Define Shannon-Fano algorithm for encoding.

c) A discrete source emits one of five symbols once every millisecond with probabilities 1/2, 1/4 , 1/8, 1/16, 1/16. Obtain the source entropy and information rate using Shannon-Fano algorithm. 5 + 5 + 5

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

a) VSB modulation

b) Envelop Detector

c) Delta modulation

d) Eye Pattern

e) Hartley-Shannon Law.