Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech (BME)/SEM-5/BME-505/2010-11

2010-11
COMMUNICATION CIRCUITS AND SYSTEMS

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 the following : 10 × 1 = 10

   i) A carrier is simultaneously amplitude modulated by two sine waves causing individual modulation of 30% and 40%. The overall modulation index is

   a) 50% b) 35%

   c) 70% d) 40%.

   ii) A 1 kW carrier is modulated to a depth of 60%. The total power in the modulated carrier is

   a) 1 kW b) 1·06 kW

   c) 1·18 kW d) 1·6 kW.

iii) Practical bandwidth of a narrow-band FM signal is equals (f_m = modulating signal frequency)

a) f_m b) $2 f_m$

c) $3 f_m$ d) $1/2 f_m$.

iv) In sampling theorem, Nyquist interval T equals

a) $1/2 f_m$ b) $1/ f_m$

c) $1/5 f_m$ d) $1/10 f_m$.

v) Quantization noise occurs in

a) PCM b) TDM

c) FDM d) PWM.

vi) To generate PCM, the signal is sampled and converted into

a) PWM b) PPM

c) PAM d) PDM.

vii) In a conventional superheterodyne receiver, the image signal frequency is given by

a) $f_s + f_i$ b) $f_s + 2 f_i$

c) $f_s - f_i$ d) $f_2 - 2 f_i$.

viii) Which of the following gives maximum probability of error ?

a) ASK b) FSK

c) PSK d) DPSK.

ix) A frequency multiplier stage should operate as

a) Class-A b) Class-AB

c) Class-B d) Class-C.

x) In order to separate out channels in an FDM receiver, it is necessary to use

a) AND gate b) Band Pass Filter

c) Band Stop Filter d) Integrator.

GROUP – B

(Short Answer Type Questions)

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

2. a) What is push-pull connection ? What is its primary advantage ?

b) What are the fundamental differences between Class-A, Class-B and Class-C amplifiers ? 3 + 2

3. What is Nyquist sampling theorem ? Prove it with necessary diagram. 1 + 4

4. a) What is meant by modulation depth ?

b) In amplitude modulation the modulation envelope has a peak value double the unmodulated carrier value. Find out the modulation index. 2 + 3

5. How do you get FM and vice-versa ?

6. Write on various modulation techniques used in Bio-telemetry.

7. A sub-carrier of 70 kHz is amplitude-modulated by tones of 2·1 and 6·8 kHz. The resulting AM signal is then used to amplitude-modulate a carrier of 12·5 MHz. Calculate all sideband frequencies in the composite signal and draw the frequency domain display of the signal.

GROUP – C

(Long Answer Type Questions)

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

8. a) With detail diagram, explain the operation of envelope detector circuit. 5

   b) Explain in detail with a block diagram and necessary equation, generation of SSB-SC signal by the phase-shift method. Give the advantages and disadvantages of this method. 5 + 2

c) An AM signal is represented as $V_{AM}(t) = 20(1 + 0{\cdot}5 \cos 6280t) \cos 6{\cdot}28 \times 10^6 t$.

Find out percentage of modulation, modulating signal frequency, carrier frequency and side-band frequencies. 3

9. a) What is frequency deviation in FM system ? 2

b) What is NBFM ? Find out its expression. 4

c) Describe generation of FM using Armstrong method. 6

d) An 800 Hz, 3 V modulating signals in an FM system produces a deviation of 6 kHz. If the modulating voltage is increased to 6 V, what will be the new frequency deviation ? 3

10. a) Distinguish between TDM and FDM. 2

b) Explain the operation of Time division multiplexing with necessary schematic diagram. 6

c) Explain how do PPM and PWM signals are generated from PAM signals. 5

d) A signal $x(t) = 2 \sin 4000\pi t + 3 \sin 5000\pi t + 4 \sin 8000\pi t$ has to be truly represented by its samples. Find the minimum sampling rate. 2

11. a) With necessary diagram, explain FSK and ASK transmitter and receiver. 10

b) Draw ASK, FSK and PSK signal generated by binary sequence 0101001. 3

c) Find out the baud rate and the minimum bandwidth necessary to pass a 15 kbps binary signal using amplitude shift keying. 2

12. a) With the help of a neat diagram, explain the working principle of successive approximation type A/D converter. 7

b) What is Delta Modulation ? With the help of a block diagram, show the Delta modulation process. 8

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

a) Superheterodyne receiver

b) VCO

c) PCM

d) PSK

e) Bio-Telemetry.