Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH/BME(O)/SEM-5/BME-505/2012-13

2012

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 : $10 \times 1 = 10$

   i) An amplitude modulated current is given by

   $i = 100 [1 + 0.4 \sin 3140 t] \sin (6.28 \times 10^5 t)$

   The modulation index of the wave is

   a) 20% b) 40%

   c) 60% d) 80%.

   ii) The length of antenna to transmit a signal must be at least

   a) $\frac{1}{3}$rd wavelength

   b) $\frac{2}{3}$rd wavelength

   c) $\frac{1}{4}$th wavelength.

iii) The modulation index of AM is changed from 0 to 1. The transmitted powers is

a) unchanged b) halved

c) doubled d) increased by 50%.

iv) An FM signal with deviation Δf is passed through a mixer, and has its frequency reduced five-fold. The deviation in the output of the mixer is

a) $5\Delta f$ b) $7\Delta f$

c) $\frac{\Delta f}{5}$ d) Δf.

v) A signal of maximum frequency of 8 kHz is sampled at Nyquist rate. The time intervals between the two successive samples will be

a) 62.5 μsec b) 125 μsec

c) 1250 μsec d) none of these.

vi) The minimum sampling frequency is called

a) Carlson frequency

b) Pulse sampling rate

c) Nyquist sampling rate.

vii) If $m(t)$ be the message signal and fc be the carrier frequency, then the following signal

$s(t) = Ac \cos [2\pi fct + kpm(t)]$ is

a) AM b) FM

c) PM d) ASK.

viii) SSB signal can be detected by

a) Envelop detector

b) PLL

c) Synchronous detector

d) Foster silly discriminator.

ix) The maximum efficiency of a direct coupled class A transistor amplifier is

a) 78.5% b) 75.8%

c) 25% d) 50%.

x) Which one of the following is not an advantage of FM over AM ?

a) Better noise immunity is provided

b) Lower band-width is required

c) The transmitted power is more useful

d) Less modulating power is required.

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 among class *A*, class *B* and class *C* amplifier ? 3 + 2

3. How can you produce FM using PM modulator ? What are the frequencies used in medical telemetry ? 3 + 2

4. a) Distinguish between analog, digital, bio-signal telemetry.

b) Explain briefly how the physiological signals can be transmitted over telephonic line. 3 + 2

5. a) What is the function of local oscillator in AM receiver ?

b) Write down the advantages of FM over AM. 2 + 3

6. a) What is companding ?

b) With a suitable block diagram, explain the principle of DM. 2 + 3

GROUP – C

(Long Answer Type Questions)

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

7. a) Express modulation index in terms of maximum and minimum voltage of modulated signal.
   b) Draw AM signal for under-modulated and over-modulated signal. State the condition for these modulation.
   c) What is DSB-SC ? With neat diagram, show how DSB-SC signal can be generated using balanced modulator.
   d) Explain why SSB modulated signal cannot be demodulated by envelop detector. 3 + (3 + 3) + 3 + 3

8. a) A video signals 5 MHz is to be transmitted through a PCM system. The signals sampled at a rate 20% more than the Nyquist rate. There are 1024 quantization level. What will be the transmission rate ?
   b) Draw ASK, FSK & PSK signal to transmit data stream 1111000111.
   c) Explain the generation of ASK and FSK with expression. 3 + 6 + 6

9. a) Explain how telemetry can be applied in patient-care and sports.
   b) Explain with neat diagram, the working principle of successive approximation type A/D converter.
   c) What is image frequency ? Why does it occur ? How can it be rejected ? (3 + 3) + 5 + (2 + 1 + 1)

10. Write short notes on any *three* of the following : 3 × 5
   a) FM demodulation using PLL
   b) TDM
   c) VSB
   d) VCO.

11. a) State & explain sampling theorem.
   b) Draw the block diagram of PAM transmitter & explain its working principle.
   c) Explain the generation and demodulation of PWM signal. 3 + 6 + 6