



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

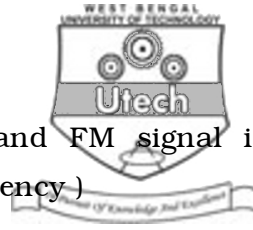
*The figures in the margin indicate full marks.*

*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 :  $10 \times 1 = 10$ 
  - 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)  $f_s - 2 f_i$ .

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

- a) ASK
- b) FSK
- c) PSK
- d) DPSK.





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.  $3 \times 15 = 45$

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



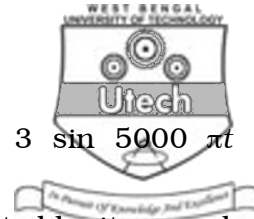
c) An AM signal is represented as

$$V_{AM}(t) = 20(1 + 0.5 \cos 6280t) \cos 6.28 \times 10^6 t.$$

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.
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