B.TECH/AEIE/5TH SEM/AEIE 3101/2016

COMMUNICATION TECHNIQUE
(AEIE 3101)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) The maximum power efficiency of an AM modulator is
(a) 25% (b) 50% (c) 33% (d) 100%.

(ii) Calculate the minimum sampling rate to avoid aliasing when a continuous time signal is given by $x(t) = 5 \cos 400\pi t$
(a) 100 Hz (b) 200 Hz (c) 400 Hz (d) 250 Hz.

(iii) The noise voltage (V_n) and the signal bandwidth (B) are related as
(a) V_n is directly proportional to B
(b) V_n is directly proportional to $\sqrt{B}$
(c) V_n is inversely proportional to $\sqrt{B}$
(d) V_n is inversely proportional B.

(iv) Guard band is
(a) the small unused bandwidth between the frequency channels to avoid interference
(b) the bandwidth allotted to the signal
(c) the channel spectrum
(d) the spectrum acquired by the noise between the signal.

(v) The interference caused by the adjacent pulses in digital transmission is called
(a) inter symbol interference (b) white noise
(c) transit time noise (d) image frequency interference.

(vi) In delta modulation, the slope overload distortion can be reduced by
(a) decreasing the step size (b) decreasing the granular noise
(c) decreasing the sampling noise (d) increasing the step size.

(vii) QPSK system uses a phase shift of
(a) Π (b) Π/2 (c) Π/4 (d) 2Π.

(viii) GSM is an example of
(a) TDMA cellular systems (b) FDMA cellular systems
(c) CDMA cellular systems (d) SDMA cellular systems.

(ix) In Differential Pulse Code Modulation techniques, the decoding is performed by
(a) Quantizer (b) Accumulator (c) Sampler (d) PLL.

(x) In digital transmission, the modulation technique that requires minimum bandwidth is
(a) PCM (b) DPCM
(c) Delta modulation (d) PAM.

Group – B

2. (a) Explain the principle of Amplitude Modulation. What is Modulation index? Compare between DSB and SSB modulation.

(b) Describe the working principle of rectifier detector.

(3 + 2 + 3) + 4 = 12

3. (a) For any given electromagnetic field, explain displacement current, reflection coefficient and transmission coefficient. What do you mean by lumped and distributed parameters?

(b) Consider an angle modulated signal
$x(t) = 4 \cos [2\pi\ 10^4\ t + 5 \sin (2\pi\ 10^3\ t)]$
Find (i) its instantaneous frequency at time, t = 0.8 milliseconds and
(ii) maximum phase deviation & maximum frequency deviation.

(2+2+2+2) + 4 = 12

Group – C

4. (a) Compare the various types of digital modulation techniques. Draw the block diagram of QPSK modulator and explain its operation.

(b) For an QPSK system operating at an information bit rate of 36kbps, find the baud, minimum bandwidth and bandwidth efficiency.

(3 + 6) + 3 = 12

5. (a) How is the quadrature amplitude modulation different from QPSK? Why are spread spectrum modulation techniques used in wireless

communication? What are the types of spread spectrum modulation techniques?

(b) Explain the elements of DPCM system with a neat block diagram.

(3 + 1 + 2) + 6 = 12

Group – D

6. (a) State sampling theorem. What is aliasing? Draw waveforms using: (i) AMI, (ii) NRZ Technique, (iii) RZ Technique, (iv) Manchester Coding with the message signal : $(1010000101)_2$.

(b) A signal x(t) = 2 sin 4000πt + 3 sin 5000πt + 4 sin 8000πt has to be truly represented by its samples. Find the minimum sampling rate from low-pass sampling theorem consideration and band-pass consideration.

(2 + 2 + 4) + 4 = 12

7. (a) Define eye pattern. Explain the elements of PCM system with a neat block diagram.

(b) What is companding? Define inter symbol interference.

(2 + 6) + (2 + 2) = 12

Group – E

8. (a) What do you mean by frequency reuse? Why is it important? Compare between Fixed Channel Assignment and Dynamic Channel Assignment.

(b) Write short note on AMPS.

(3 + 2 + 3) + 4 = 12

9. (a) Compare among CDMA, TDMA and FDMA. What is communications satellite? What are the functions of earth station?

(b) Write short note on Bluetooth.

(4 + 1 + 2) + 5 = 12