(3 Hours) **[Total Marks: 80]**

N.B.
(1) Question No.1 is compulsory.
(2) Out of remaining attempt any three.
(3) Assume & mention suitable data wherever required.
(4) Figures to right indicates full marks

Q.1. Solve any four **[20]**

a) Define modulation and explain why modulation is required in communication systems.
b) Differentiate between analog and digital communication systems with examples.
c) Explain different types of Noise sources.
d) Explain the role of bandwidth in communication systems.
e) What are the key differences between Phase Modulation (PM) and Frequency Modulation (FM)?
f) Write short note on Quantization process.

Q.2 **[20]**

a) A 1 MHz carrier is amplitude modulated by a 10 kHz audio signal, resulting in a modulated signal with a modulation index of 0.6. The carrier amplitude is 10V.
Calculate:
i. The total power of the modulated signal.
ii. The power in the sidebands.

b) Discuss signal-to-noise ratio (SNR) and its importance in communication systems.

Q.3 **[20]**

a) State and prove the following properties of Fourier Transform:
1. Time Scaling
2. Frequency shifting
3. Convolution in time domain
4. Time shifting

b) Explain the principle of TDM with neat diagram. Also explain need of synchronization in TDM.

Q.4 **[20]**

a) With the help of neat circuit diagram explain the generation of AM Wave. Also derive the mathematical expression for AM Wave.
b) Explain the principle of phase modulation (PM). Compare it with frequency modulation (FM).

Q.5 **[20]**

a) Explain need of sampling. With a neat diagram explain the sampling theorem for low pass band limited signal.
b) Explain the working of fiber optic communication systems with a neat block diagram.

Q.6 Solve any four **[20]**

a) Explain Time Division Multiplexing (TDM) and its application in communication systems.
b) Sky Wave propagation
c) What are the different types of noise encountered in communication? Explain their impact.
d) Explain the concept of sampling in Pulse Code Modulation (PCM).
e) Pre-emphasis and De-emphasis
f) Differentiate between Amplitude Shift Keying (ASK) and Frequency Shift Keying (FSK).
