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

Instructions:
(1) Question 1 is compulsory, solve any three from remaining questions
(2) Assume suitable data if necessary.
(3) Diagrams to be drawn neatly.

Q 1) Solve any four questions. [20]
a) List several sources of external noise and give a brief description of each.
b) Would it be possible to transmit one intelligent signal in the upper sideband and a different intelligent signal in the lower sideband of a AM or DSB signal? Explain.
c) Explain noise triangle in FM
d) Discuss the need for Pre emphasis and De-emphasis circuits with waveform
e) Explain why the local oscillator frequency is always chosen as f_s+f_{IF} and not f_s-f_{IF} ?

Q 2) a) With the help of a neat block diagram explain the FM transmitter using Armstrong method of FM generation. [10]
b) A sinusoidal carrier has amplitude of 10v and frequency 30 KHz is amplitude modulated by a sinusoidal voltage of amplitude 3v and frequency 1Khz. Modulated voltage is developed across a 50Ω resistance. [10]
i) Write the equation for modulated wave and draw the modulated wave indicating Vmax, Vmin
ii) Determine modulation index. And calculate total power in modulated wave.
iii) Draw the spectrum of modulated wave.

Q 3) a) With a neat block diagram explain the working of super-heterodyne receiver with waveforms at the output of each block. Explain the function of each block. [10]
b) State and Prove Sampling theorem for low pass signals. Draw the spectrum of sampled signal for fs>2W, fs<2W,fs=2W. What is aliasing error? How can you overcome it? [10]

Q 4) a) What is delta modulation? Explain in detail why adaptive delta modulation is required? [10]
b) Discuss the generation and demodulation of PPM signal. For a sinusoidal modulating signal, draw PPM and PWM pulses. [10]

Q 5) a) Define the following propagation terms [10]
v) Critical frequency and Critical Angle
ii) Virtual Height
iii) MUF
iv) Skip Distance and skip zone
v) Free space path loss
b) What is multiplexing in communication system? Draw a block diagram of frequency division multiplexing to transmit 5 SSB signals.

Q 6) Write short note on **any four.** [20]
i) Companding.
ii) T1 Digital carrier System.
iii) Product demodulator of SSB-SC
iv) AGC in superheterodyne receiver.
v) ISB Transmission.
