

- N.B. : (1) Question No. 1 is compulsory.
 (2) Attempt any four from remaining questions.
 (3) Assume suitable additional data if necessary and state them clearly.

1. Answer the following :
- Explain frequency spectrum of the AM wave. 4
 - Explain FM noise triangle. 4
 - What is meant by Nyquist rate in sampling, what is standard sampling frequency for speech signal ? 4
 - What is companding ? 4
 - Describe the space wave propagation. 4
2. (a) The AM transmitter develops an unmodulated power output of 400 watts, across a 50Ω load. The carrier is modulated by a sinusoidal signal with a modulation index 0.8. 10
 Assuming $f_m = 5 \text{ KHz}$ and $f_c = 1 \text{ MHz}$
- Find the V_c and write equation of AM
 - Find the total power of the modulated output.
- (b) In FM explain : 10
- Maximum Frequency Deviation
 - Modulation Index
 - Pre-emphasis
 - De-emphasis
 - Frequency spectrum and bandwidth.
3. (a) Find the mathematical expression of FM signal. 10
 (b) Explain slope overload error and hunting error in Delta modulation. Find the condition to avoid slope overload error. 10
4. (a) A FM signal is given by : 10

$$V = 10 \sin [5 \times 10^8 \epsilon + 4 \sin 1250 \epsilon].$$
 Find : (i) Carrier and Modulating Frequencies.
 (ii) Modulation Index and Maximum deviation.
 (iii) The Power dissipated by this FM wave in a 5Ω resistor.
- (b) What is multiplexing in communication system ? Draw the block diagram of TDM-PCM system. Also calculate the bit rate at the output of this system. 10
5. (a) (i) State advantage of digital communication over analog communication. Justify each point. List some digital communication techniques. 6
 (ii) Explain what is meant by quantization noise. 4
 (b) A receiver is tuned to 3-30 MHz frequency range of 40-525 MHz : 10
 (i) Find the range of local oscillator frequency and image frequency. It is an AM receiver with each channel occupying 10 KHz bandwidth.
 (ii) Draw Frequency response of IF and AF amplifiers.
6. (a) Draw the block diagram of phase cancellation SSB generator and explain how the carrier and unwanted sidebands are suppressed. What changes is necessary to suppress the other sideband ? 10
 (b) (i) Compare Wideband and Narrowband FM 5
 (ii) Compare FDM and TDM. 5

7. (a) Describe the following terms in relation with skywave propagation ?

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(i) Skip Distance

(ii) Critical Frequency

(iii) Virtual Height

(iv) Maximum Usable Frequency.

(b) Write short notes on the following (any **two**) :-

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(i) Automatic Gain Control (AGC)

(ii) Ground Wave Propagation

(iii) Direct Method of FM Generation.
