N.B.: (1) Question No. 1 is compulsory.
(2) Solve any three questions from the remaining five questions.
(3) Assume suitable data if necessary.

1. Give brief answers to any four of the following:—
   (a) Explain ground wave propagation of electromagnetic radiations.
   (b) Draw the spectrum of an amplitude modulated wave and explain its components.
   (c) Give advantages and disadvantages of SSB over full carrier DSB with amplitude modulated wave.
   (d) Discuss the factors that influence the modulation index of an FM wave.
   (e) How is adaptive delta modulation superior to delta modulation?

2. (a) What is a DSBSC wave? Explain its generation using balanced modulator.
     (b) Discuss the factors that influence the choice of IF in superheterodyne receivers.
     (c) The maximum deviation allowed in a FM broadcast system is 75 kHz. If the modulating signal is a single tone sinusoidal of frequency 15 kHz, find the bandwidth of the FM signal. How does the bandwidth change if the modulating frequency is doubled?

3. (a) How can you use a varactor diode in the generation of FM wave? Explain in detail.
     (b) List out the advantages and disadvantages of FM over AM.
     (c) Calculate the thermal noise power available from any resistor at a temperature of 290 K for a bandwidth of 1 MHz. Calculate also the corresponding noise voltage if the resistance, \( R = 100 \, \Omega \).

4. (a) Draw the PAM, PWM and PPM waveforms in time domain assuming a sinusoidal modulating signal. Explain them in brief.
     (b) What do you understand by signal multiplexing? Explain TDM and FDM with suitable examples.

5. (a) Explain the working of a superheterodyne receiver with the help of a neat block diagram. Show the waveforms at the output of each block.
     (b) Compare analog and digital transmission systems.
     (c) What is VSB? Mention its application.

6. Write short notes on any four of the following:—
   (a) Pre-emphasis and de-emphasis
   (b) Automatic gain control
   (c) Ratio detector
   (d) Electromagnetic spectrum
   (e) Noise figure.

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