

JHARKHAND UNIVERSITY OF TECHNOLOGY

Diploma 3rd Semester Examination

COMMUNICATION SYSTEMS (ECE 303)

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Time: 3 Hours

Full Marks: 70

SET: 2

INSTRUCTIONS:

1. Question No. 1 is Compulsory.
2. Answer any **FOUR** questions from the remaining (Q.2 to Q.7).
3. Figures in the margin indicate full marks.

Q.1. Multiple Choice Questions

[2 × 7 = 14]

(i) The modulation index (μ) for AM is given by:

- | | |
|----------------------|-----------------|
| (a) V_m / V_c | (b) V_c / V_m |
| (c) $V_m \times V_c$ | (d) $V_m + V_c$ |

(ii) Carson's Rule for FM bandwidth is:

- | | |
|-------------------------|---------------------------|
| (a) $2(\Delta f - f_m)$ | (b) $2(\Delta f + f_m)$ |
| (c) $2\Delta f$ | (d) $\Delta f \times f_m$ |

(iii) Which wave propagation method is used for satellite communication?

- | | |
|-----------------|------------------|
| (a) Ground Wave | (b) Sky Wave |
| (c) Space Wave | (d) Surface Wave |

(iv) In PWM, the parameter that varies is:

- | | |
|---------------------------|------------------------|
| (a) Amplitude | (b) Width of the pulse |
| (c) Position of the pulse | (d) Frequency |

(v) The simplest form of AM demodulator is:

- | | |
|--------------------|-------------------|
| (a) Ratio Detector | (b) PLL |
| (c) Diode Detector | (d) Foster-Seeley |

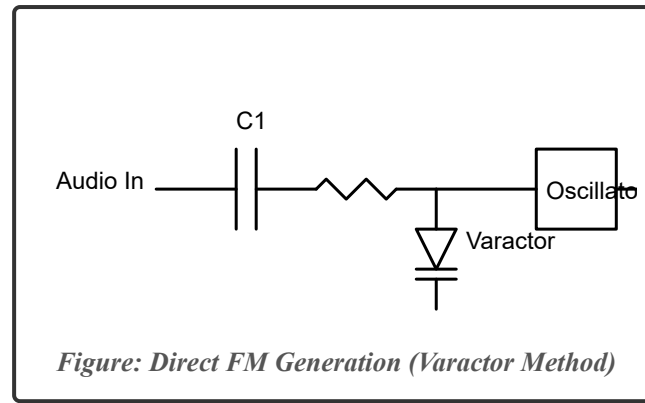
(vi) Image Frequency (f_{si}) is calculated as:

- | | |
|-----------------|-----------------|
| (a) $f_s + 2IF$ | (b) $f_s - 2IF$ |
| (c) $f_s + IF$ | (d) $f_s - IF$ |

(vii) Over-modulation in AM results in:

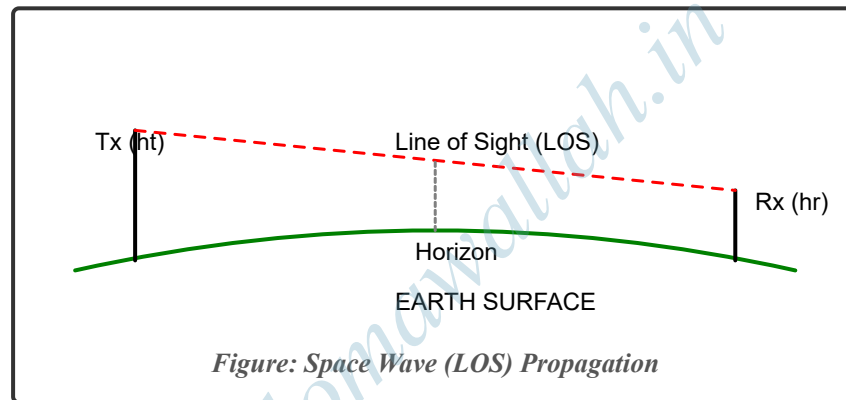
- | | |
|----------------------|-----------------------|
| (a) Distortion | (b) Increased Power |
| (c) Better Reception | (d) None of the above |

Q.2. (a) Explain the **Generation of FM** using the **Varactor Diode Method** (Direct FM) with a circuit diagram. [7]



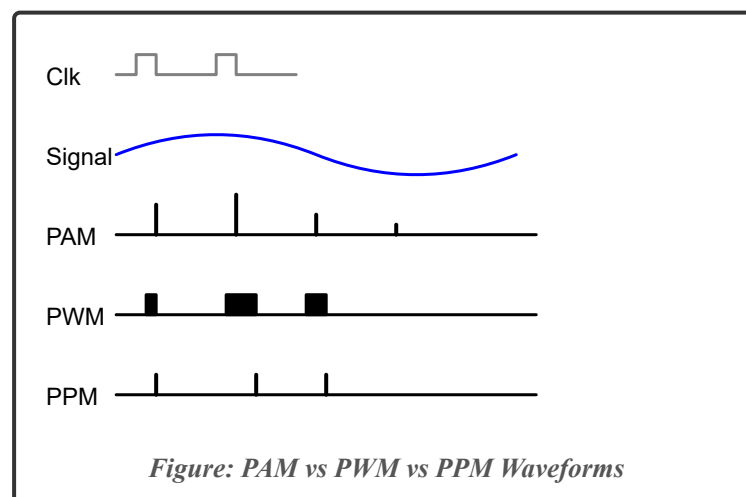
Q.2. (b) Calculate the **Total Power** and **Sideband Power** of an AM wave if the Carrier Power is 500W and Modulation Index is 0.8. [7]

Q.3. (a) Explain **Space Wave Propagation** (Line of Sight). Derive the expression for the **Radio Horizon** distance ($d = 3.57(\sqrt{h_t} + \sqrt{h_r})$). [7]



Q.3. (b) Draw the block diagram of a **High-Level AM Transmitter** and explain the function of the Buffer Amplifier and Class C Modulated Amplifier. [7]

Q.4. (a) Compare **PAM, PWM, and PPM**. Draw waveforms to show how they differ. [7]



Q.4. (b) Explain the working of **Foster-Seeley Discriminator** for FM demodulation. [7]

Q.5. (a) What is **SSB-SC** (Single Sideband Suppressed Carrier)? What are its advantages over DSB-FC? Explain the **Phase Shift Method** for SSB generation. [7]

Q.5. (b) Explain the concept of **Quantization Noise** in PCM. How can it be reduced? [7]

Q.6. (a) Explain the **Armstrong Method** for generating Indirect FM. [7]

Q.6. (b) What is **Fading** in wave propagation? Explain different types of fading. [7]

Q.7. Write Short Notes on (Any FOUR):

[3.5 × 4 = 14]

- a. Limiter Circuit in FM
 - b. Skip Distance & Virtual Height
 - c. Image Frequency
 - d. Need for Synchronization in PCM
 - e. Comparison of Analog vs Digital Communication
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Diploma Wallah: Solution Key

MCQ: (i) a, (ii) b, (iii) c, (iv) b, (v) c, (vi) a, (vii) a.

Q2(b) Answer: $P_t = P_c (1 + \mu^2/2) = 500(1 + 0.64/2) = 660 \text{ W}$. Sideband P = 160W.

Q5(a) Hint: SSB uses less power and half bandwidth. Phase shift method uses two balanced modulators with 90° phase shift.

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