

# JHARKHAND UNIVERSITY OF TECHNOLOGY

Diploma 3rd Semester Examination

## **COMMUNICATION SYSTEMS (ECE 303)**

More Model Sets & Study Materials available here [Diplomawallah.in](https://Diplomawallah.in)

**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 ( $\mu$ ) 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

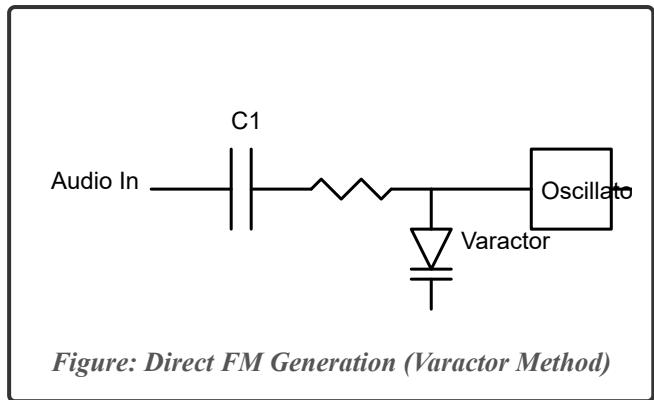
**(vi) Image Frequency ( $f_{si}$ ) is calculated as:**

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

**(vii) Over-modulation in AM results in:**

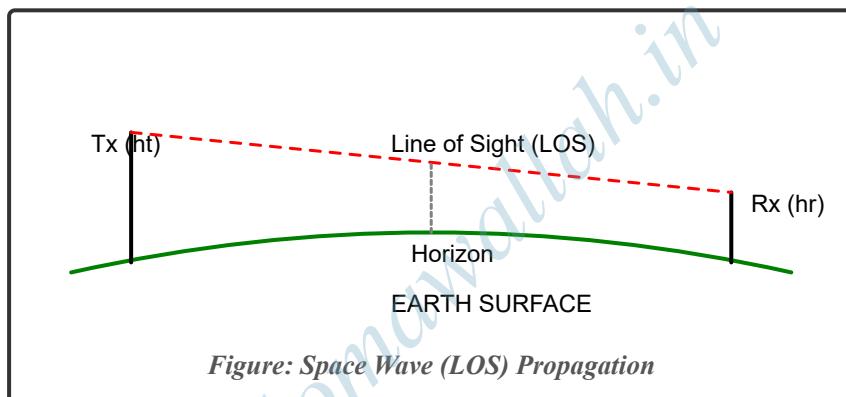
(a) Distortion	(b) Increased Power
(c) Better Reception	(d) None of the above

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



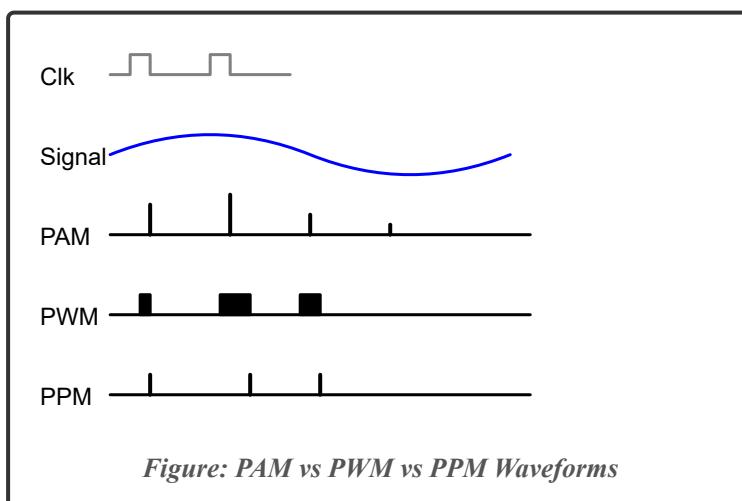
**Q.2. (b)** Calculate the **Total Power** and **Sideband Power** of an AM wave if the Carrier Power is 500W and Modulation Index is 0.8. [7]

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

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**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]

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**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

### 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  $90^\circ$  phase shift.