

# JHARKHAND UNIVERSITY OF TECHNOLOGY

## Diploma 3rd Semester Examination (DIPLOMA WALLAH)

# **COMMUNICATION SYSTEMS (ECE 303)**

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

**Time: 3 Hours**

**Full Marks: 70**

SET: 3

## 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**

$$[2 \times 7 = 14]$$

(i) 100% modulation in AM corresponds to a modulation index of:

(ii) The phenomenon of "Skip Distance" is associated with:

(a) Ground Wave	(b) Space Wave
(c) Sky Wave	(d) Tropospheric Scatter

(iii) In a superheterodyne receiver, the Mixer stage is also known as:

**(iv) Pre-emphasis is done at the:**

- (a) Transmitter
- (b) Receiver
- (c) Channel
- (d) Antenna

**(v) Which is a Digital Modulation technique?**

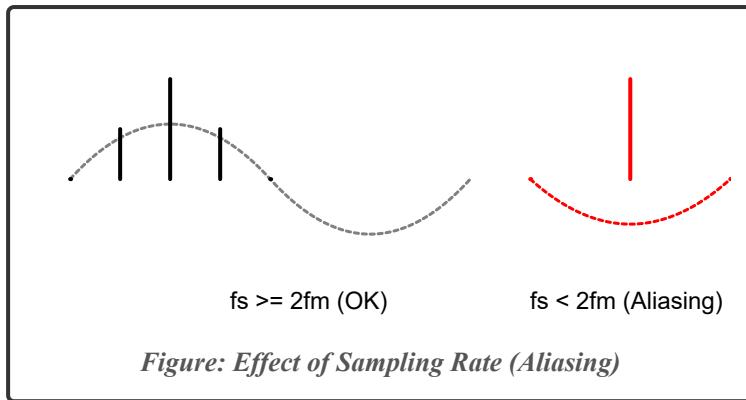
(vi) If the maximum frequency in a signal is  $W$ , the Nyquist Rate is:

(a) W (b) 2W  
(c)  $W/2$  (d)  $4W$

(vii) Ground wave propagation is suitable for frequencies:

## SECTION B (LONG ANSWER TYPE)

**Q.2. (a)** What is **Sampling Theorem**? Explain the effect of **Aliasing** if the sampling rate is less than the Nyquist rate ( $f_s < 2f_m$ ). [7]



*Figure: Effect of Sampling Rate (Aliasing)*

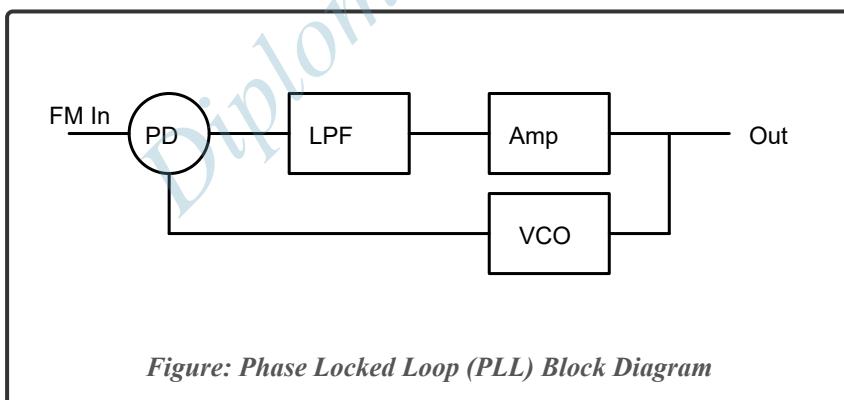
**Q.2. (b)** Draw the block diagram of a **TRF (Tuned Radio Frequency) Receiver**. What are its main disadvantages (Instability, Variation in Bandwidth)? [7]

**Q.3. (a)** Explain **Ratio Detector** for FM demodulation. How is it better than a slope detector? [7]

**Q.3. (b)** Define **Signal-to-Noise Ratio (SNR)** and **Noise Figure**. Explain the effect of noise in AM and FM systems. [7]

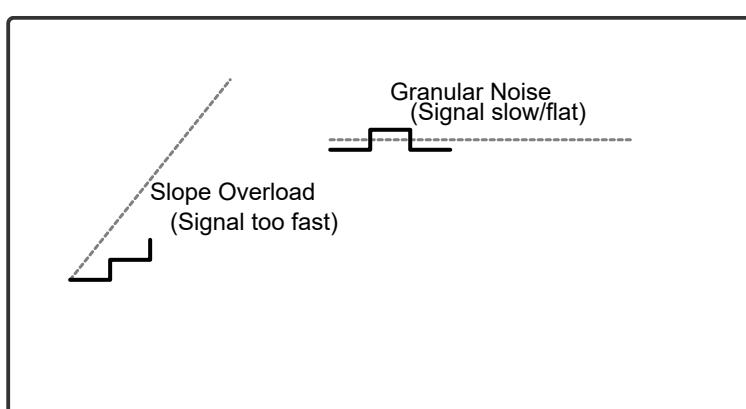
**Q.4. (a)** Derive the relationship between **Total Current (It)** and **Carrier Current (Ic)** in AM. If  $I_c = 10A$  and  $\mu = 0.5$ , calculate  $I_t$ . [7]

**Q.4. (b)** Explain the working of a **Phase Locked Loop (PLL)** and its application as an FM Demodulator. [7]



*Figure: Phase Locked Loop (PLL) Block Diagram*

**Q.5. (a)** Explain **Delta Modulation (DM)**. What is **Slope Overload Distortion** and **Granular Noise**? [7]



**Q.5. (b)** Explain **Ground Wave Propagation**. Why is it limited to low frequencies and short distances? [7]

**Q.6. (a)** Draw the block diagram of an **FM Transmitter** (Reactance Modulator type) and explain its working. [7]

**Q.6. (b)** Comparison between **Ground Wave, Sky Wave, and Space Wave** propagation on the basis of Frequency range and Mode of travel. [7]

**Q.7. Write Short Notes on (Any FOUR):** **[3.5 × 4 = 14]**

- a. Single Sideband (SSB) Transmission
- b. Advantages of Superheterodyne Receiver
- c. Quantization Process
- d. Double Sideband Suppressed Carrier (DSB-SC)
- e. Concept of Guard Band

### **Diploma Wallah: Solution Key**

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

**Q2(a) Hint:** Aliasing occurs if  $f_s < 2f_m$ . Use Low Pass Filter (Anti-aliasing filter) before sampling.

**Q4(a) Answer:**  $I_t = 10 * \sqrt{1 + 0.25/2} = 10 * 1.06 = \mathbf{10.6 \text{ A}}$ .