

# 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 × 7 = 14]**

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

- (a) 0
- (b) 0.5
- (c) 1.0
- (d) Infinity

**(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:**

- (a) Demodulator
- (b) Frequency Changer
- (c) Audio Amplifier
- (d) RF Amplifier

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

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

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

- (a) PAM
- (b) FM
- (c) ASK
- (d) AM

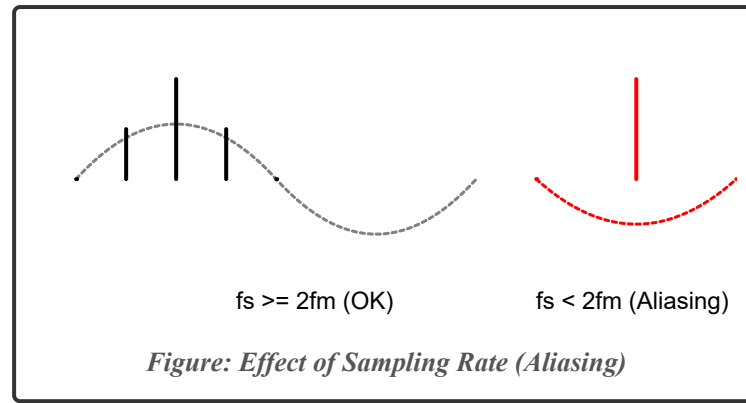
**(vi) If the maximum frequency in a signal is W, the Nyquist Rate is:**

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

**(vii) Ground wave propagation is suitable for frequencies:**

- (a) < 2 MHz
- (b) > 30 MHz
- (c) > 1 GHz
- (d) > 300 MHz

**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]



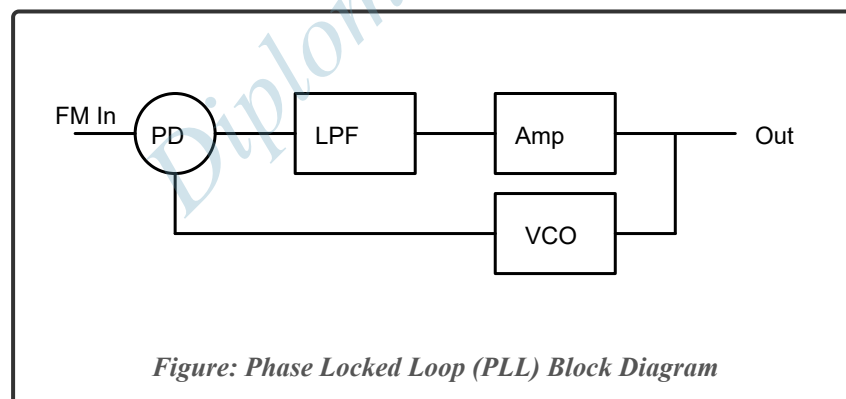
**Q.2. (b)** Draw the block diagram of a **TRF (Tuned Radio Frequency) Receiver**. What are its main disadvantages (Instability, Variation in Bandwidth)? [7]

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

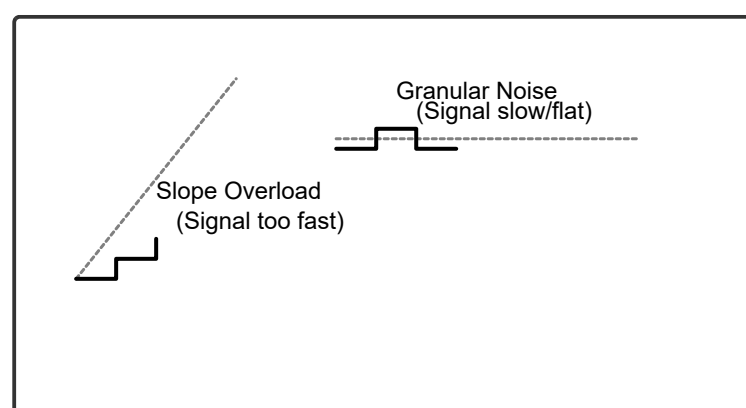
**Q.3. (b)** Define **Signal-to-Noise Ratio (SNR)** and **Noise Figure**. Explain the effect of noise in AM and FM systems. [7]

**Q.4. (a)** Derive the relationship between **Total Current ( $I_t$ )** and **Carrier Current ( $I_c$ )** 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]



**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]

- Single Sideband (SSB) Transmission
- Advantages of Superheterodyne Receiver
- Quantization Process
- Double Sideband Suppressed Carrier (DSB-SC)
- 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:**  $I = 10 * \sqrt{1 + 0.25/2} = 10 * 1.06 = 10.6 \text{ A}.$