

**ET703M - Radar and Satellite Communication**

P. Pages : 2

Time : Three Hours



**GUG/W/22/14249**

Max. Marks : 80

- 
- Notes :
1. All questions carry marks as indicated.
  2. Assume suitable data wherever necessary.
  3. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) Derive Radar range equation. 8
- b) Calculate the maximum range of Radar for the following specifications 8  
Operating frequency,  $f = 10\text{GHz}$   
Peak power transmitted by the Radar,  $P_t = 400\text{KW}$   
Effective aperture of the receiving Antenna,  $A_e = 5\text{m}^2$   
Radar cross section of the target,  $\sigma = 30\text{m}^2$   
Power of minimum detectable single,  $S_{\min} = 10^{-10}\text{W}$

**OR**

2. a) Explain the following terminology of Radar 8  
i) Maximum Unambiguous Range  
ii) Minimum Range
- b) Derive the Equation of finding Doppler frequency,  $f_d$ . 8
3. a) Write a short note on FMCW Radar. 8
- b) An MTI Radar operates at a frequency of 6GHz with a pulse repetition frequency of 1KHz. Find the first, second and third blind speeds of this Radar. 8

**OR**

4. a) Explain the following terms related to Radar antenna 8  
i) Directivity. ii) Aperture Efficiency.  
iii) Antenna Efficiency. iv) Gain
- b) Write a short note on Double Delay Line Cancellor. 8
5. a) i) List the Pros and Cons of Satellite Communication 8  
ii) Explain Applications of Satellite Communication.
- b) Explain any four Orbital elements that are used for describing the orbital motion of satellites. 8

**OR**

6. a) Explain following Orbital Equations 8  
i) Forces acting on Satellite.  
ii) Orbital Velocity.
- b) Write a short note on Kepler's Laws for satellite communication. 8
7. a) Write short note on 8  
i) Medium Earth Orbit (MEO) satellites.  
ii) Low Earth Orbit (LEO) satellites.
- b) Explain following Look Angles 8  
i) Azimuth Angle  
ii) Elevation Angle

**OR**

8. a) i) Explain four stages in launching a satellite. 8  
ii) Explain the two types of satellite launch vehicles.
- b) Explain following Space Segment Subsystems 8  
i) AOC Subsystem  
ii) TTCM Subsystem
9. a) Explain four types of Satellite Antennas. 8
- b) Draw and explain Block diagram of Transponder. 8

**OR**

10. a) Draw and explain Block Diagram of Earth Station. 8
- b) Explain Community Antenna TV system. 8

\*\*\*\*\*