

**ET703M - Radar and Satellite Communication**

P. Pages : 2

Time : Three Hours



**GUG/W/23/14249**

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) With neat block diagram explain pulse compression radar. **8**
- b) Derive radar range equation. **8**

**OR**

2. a) Calculate the maximum range of Radar for the following specifications: **8**  
Power of minimum detectable signal  $S_{\min} = 10^{-12} \text{ W}$   
Gain of transmitting antenna,  $G = 3000$   
Effective aperture of receiving antenna,  $A_e = 5 \text{ m}^2$   
Peak Power transmitted by Radar,  $P_t = 450 \text{ kW}$   
Radar cross-section of target,  $\sigma = 30 \text{ m}^2$ .
- b) Explain the following radar terms : **8**  
i) Maximum Unambiguous Range  
ii) Pulse Repetition Frequency
3. a) Which are two types of MTI Radars based on type of transmitter used? Explain any one in detail. **8**
- b) An aircraft is travelling with a speed of 120 kmph. For tracking the aircraft a Radar is deployed which operates at a frequency of 6 GHz. Find the Doppler frequency of moving aircraft during this tracking. **8**

**OR**

4. a) Write a note on construction and working of parabolic reflector antenna with Cassegrain feed used in Radar systems. **8**
- b) Write a short note on FMCW Radar. **8**
5. a) i) Calculate the radius of a circular orbit for which the period is 1 day. **4**

- ii) Define the following terms for Earth-Orbiting Satellites: 4  
Subsatellite path  
Apogee  
Line of apsides  
Ascending node

- b) Explain the following terms of Earth station antenna 8  
i) Azimuth Angle  
ii) Elevation Angle

**OR**

6. a) Explain following space segment subsystems 8  
i) AOC subsystem  
ii) TTCM Subsystem

- b) Write a note on Orbital perturbations. 8

7. a) List the multiple access methods used by satellites for receiving signals from earth stations. Explain any one method in detail. 8

- b) Explain the link budget calculations for Uplink phenomena. 8

**OR**

8. a) Explain the ionospheric effects on signal travelling between earth station and satellite. 8

- b) Write a note on Rain induced attenuation and interference in satellite communication. 8

9. a) Write a short note on GPS codes and services. 8

- b) Write a short note on Community Antenna TV (CATV) system. 8

**OR**

10. a) Write a short note on Direct Broadcast Satellite (DBS) system. 8

- b) Write a short note on GPS receiver. 8

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