

FACULTY OF ENGINEERING

B.E. IV/IV Year (ECE) II Semester (Main) Examination,

April 2006

(New)

RADAR AND SATELLITE COMMUNICATION SYSTEMS

Time : 3 Hours]

[Max. Marks : 75

Answer all questions of Part A.

Answer five questions from Part B.

Part A – (Marks : 25)

1. What is the effect of pulse repetition frequency on the performance of the Radar?
2. List the different types of Radar antennas used.
3. Define "Radar Cross Section" of a target.
4. Give at least two applications of monopulse Radar.
5. Distinguish between "search mode" and "tracking mode" of a Radar.
6. State the law of planetary motion.
7. What are the various orbits in which a satellite can exist?
8. What is meant by look angles?
9. List the parameters that control the design of an earth station.
10. List the various techniques of multiple access.

Part B – (Marks : 5 × 10 = 50)

11. (a) Obtain the Radar range equation from first principle. Discuss its usefulness in predicting the maximum range.
(b) What is integration of Radar pulses? How does it help to improve the performance?
12. (a) Show that a CW Radar can determine the range but of no practical use. Explain how it can measure range and velocity using frequency modulation.
(b) Explain the principle of operation of an MTI Radar. Discuss the limitations of "blind speeds" in MTI Radars.

[P.T.O.]

13. (a) What is the significance of a "monopulse"? Describe the operation of an amplitude comparison monopulse Radar with a neat block schematic diagram.
- (b) What are the different methods of tracking in range? Describe in detail any two of these methods.
14. (a) With neat sketches explain the operation of the following Radar displays:
(i) A-scope (ii) PPI (iii) RMI and (iv) B-scope.
- (b) What do you mean by perigee and apogee? Derive an expression for the velocity of a satellite at its perigee and apogee in terms of semi-major axis and eccentricity of earth.
15. (a) Why is the "UPLINK" frequency different from the "DOWN LINK" frequency in a satellite communication system?
- (b) Derive the general link design equation. Find out the expressions for $\left(\frac{C}{N}\right)$ and $\left(\frac{G}{T}\right)$ ratios. Explain the importance of these ratios on the satellite link design.
16. (a) Explain the following with their merits and demerits:
(i) TDMA (ii) FDMA and (iii) CDMA
- (b) Explain briefly about the basic satellite primary power systems and their elements.
17. (a) Discuss in detail the effect of the following on satellite link:
(i) Rain and ice
(ii) Atmospheric absorption and
(iii) Multipath.
- (b) What are the frequency bands allocated to satellite communications in India and explain the reasons for the same?
- (c) Explain satellite data communication protocols.