MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : EC-801C

SATELLITE COMMUNICATION & REMOTE SENSING

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) INTELSAT stands for

a) International Telecommunications Satellite

b) Indian Telecommunications Satellite

c) Inter Telecommunications Satellite

d) None of these.

ii) For an elliptical orbit

a) $0 < e < 1$ b) $e = 0$

c) $e = 1$ d) none of these.

iii) Ascending node is

a) the point where the orbit crosses the equatorial plane going from south to north

b) the point longest from earth

c) the point closest approach to earth

d) none of these.

iv) Argument of perigee is

a) The angle from ascending node to perigee, measured in the orbital plane at the earth's centre, in the direction of satellite motion

b) the point longest from earth

c) the point closest approach to earth

d) none of these.

v) The down link frequency in the *C* band transponder is

a) 6 GHz

b) 4 GHz

c) 14 GHz

d) 11 GHz.

vi) Kepler's third law states

a) $T^2 \propto a^3$

b) $T^3 \propto a^2$

c) $T^2 \propto a^{3/2}$

d) $T^{2/3} \propto a^2$.

vii) The carrier to noise ratio for a satellite depends upon

a) Effective Isotropic Radiated power

b) Bandwidth

c) Free space path losses

d) all of these.

viii) Atmospheric drag has negligible effect on

a) geostationary satellites

b) MEO

c) LEO

d) none of these.

ix) Which antenna is used for sending back signals from satellite to earth ?

a) Dipole antenna

b) Horn antenna

c) Yagi antenna

d) Chicken-mash antenna.

x) Which of the following is not a passive remote sensors ?

a) Gravimeter

b) RADAR

c) LIDAR

d) SONAR.

xi) Thermal IR region of the EM spectrum corresponds to the wavelength range

a) 1 mm - 1 m

b) 3 μm - 35 μm

c) 0·03 nm - 0·3 nm

d) 0·07 μm - 0·7 μm.

xii) Albedo is the unit of

a) Radiant flux

b) Emissivity

c) Reflectance

d) Absorption.

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following 3 × 5 = 15

2. What are Kepler's three laws of planetary motion ?
3. Give the mathematical formulation of Kepler's third law of planetary motion.
4. What are the various interferences that may affect the satellite link performance ?
5. What is the system noise temperature ? Derive the expression for equivalent noise temperature. 2 + 3
6. Show that performance of a satellite earth station can be specified by the (G/T) parameter of the downlink receiving system.

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Explain briefly the orbital parameters required to determine a satellite orbit.
   b) What is meant by look angles ? Explain them with reference to a geostationary satellite and earth station.
   c) Show that three suitable located geostationary satellites could efficiently provide global communication.
   d) From which regions of the earth geostationary satellite is not visible ? 4 + (2 + 4) + 4 + 1

8. a) What is the basic difference between geosynchronous and geostationary orbit ?
   b) Explain how a satellite is placed into geostationary orbit from earth.
   c) Discuss the orbital effects in communication system performance. 2 + 5 + 8
9. a) Explain the working principle of a *C*-band and *Ku*-band transponder with the help of block diagram.
   b) Explain the bathtub curve for probability of failure and prove that reliability of a device decreases exponentially with time.
   c) What is redundancy and why is it necessary for the satellite sub-system ? 6 + 6 + 3
10. a) Draw the block diagram of satellite showing various subsystems.
   b) What are the attitude and orbit control system ? Explain how these perform their functions. 5 + 2 + 8

11. Write short notes on any *three* of the following : 3 × 5

a) VSAT

b) GPS system

c) Multiple access technique

d) Friis transmission equation

e) Application of Remote sensing.