# SATELLITE COMMUNICATION APPLICATIONS
## (ECEN 5141)

**Time Allotted : 3 hrs** **Full Marks : 70**

***Figures out of the right margin indicate full marks.***

***Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.***

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

## Group – A
## (Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) A satellite orbit in which the orbital plane maintains a fixed orientation with respect to earth-Sun direction is
(a) Geostationary orbit (b) Molniya orbit
(c) Sun-synchronous orbit (d) Low earth orbit.

(ii) The most widely used frequency spectrum in the 6/4 GHz band with an uplink of
(a) 5GHz-7GHz (b) 5.5 GHz -7.5GHz
(c) 5.2 GHz-5.8 GHz (d) 5.725 GHz-7.075GHz.

(iii) The orbital period in case of Monliya satellites is
(a)12 hr (b) 24 hr (c) 8hr (d) 16 hr.

(iv) In satellite communication for a communication channel using a 36MHz transponder bandwidth, the IF frequency chosen is
(a) 70 MHz (b) 140 MHz
(c) 80 MHz (d) 36MHz.

(v) The effect of atmospheric drag is more predominant on
(a) LEO satellites (b) GEO satellites
(c) MEO satellites (d) all of these.

(vi) Due to the position of the *mascons* and equatorial bulges the number of stable equilibrium points in the geostationary orbit are
(a) 2 (b)4 (c)6 (d)10.

(vii) A table or data file giving the calculated position of a celestial object at regular intervals throughout a period is called
(a) almanac data (b) ephemeris data
(c) AKM data (d) none of these.

(viii) In case of Geostationary satellites, the inclination of the orbit increases at an average rate of about
(a) $0.85^o$ per year (b) $1^o$ per year
(c) $0.65^o$ per year (d) $1.85^o$ per year.

(ix) The transponder is assigned to individual user either permanently or for long duration in case of
(a) PAMA (b)DAMA (c)RMA (d) none of these.

(x) The part of the GPS signal structure that contains information on the position of the satellite at any given time is
(a) ephemeris data (b) pseudorandom code
(c) almanac data (d) None of these

## Group – B

2. (a) Define Right Ascension of Ascending Node and Argument of the perigee with proper diagram.

(b) A satellite is moving in an elliptical orbit with the major axis equal to 42000km. If the perigee distance is 8000Km find the apogee and the orbit eccentricity. What is meant by inclination of an orbit?

**6 + (4 + 2) = 12**

3. (a) Explain the process of placing Satellites into Geostationary orbits.

(b) Briefly describe the satellite communication sub-system for a 6/4 GHz band.

**6 + 6 =12**

## Group – C

4. (a) Discuss in brief the attenuation caused by rain in the transmission of signals in satellite communication.

(b) What is Link Budget? How are they utilized to design satellite links?

**6 + (2 + 4) = 12**

5. (a) Draw the block diagram of a single conversion bend pipe transponder for 6/4 GHz. Explain the functions of each block.

(b) Explain the term transponder hopping, polarization hopping and redundancy configuration.

**(2 + 4) + 6 = 12**

## Group – D

6. (a) Describe the principal of TDMA. Draw and label the TDMA frame structure.

(b) What is a digital speech interpolation technique?

**(6 + 2) + 4 =12**

7. (a) What is meant by DAMA? How it is being used by multiple users to share a common link?

(b) Write a brief note on satellite packet communication.

**(2 + 4) + 6 = 12**

## Group – E

8. (a) What is VSAT? Describe a typical VSAT network with diagram.

(b) Differentiate between star topology and mesh topology.

**(2+4) + 6 = 12**

9. (a) What is MSAT network?

(b) Describe the basic configuration of MSAT network.

(c) Briefly explain how call connections are set up in MSAT. What is outbound and inbound link?

**4 + 3 + (3+2)=12**

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| ECE | https://classroom.google.com/w/MjIxMzE1MTgwNjM5/tc/Mjg2Mjc5NzAzOTc3 |