2015

Satellite Communication
(ECEN 5241)

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 x 1=10**

    (i) Generally VSAT networks are operated in :
    - (a) TDMA mode
    - (b) FDMA mode
    - (c) CDMA mode
    - (d) None of these.

    (ii) Calculate the radius of a circular orbit for which the period is 1 day?
    - (a) 42.241Km
    - (b) 42.241m
    - (c) 4.241Km
    - (d) 2.241Km.

    (iii) Molniya orbits are orbits with:
    - (a) High inclination
    - (b) high eccentricity
    - (c) low inclination
    - (d) both (a) and (b).

    (iv) In a circular geostationary orbit in the equatorial plane,
    - (a) the apogee equals the perigee
    - (b) the apogee is twice the perigee
    - (c) the perigee is twice the apogee
    - (d) none of these.

    (v) The uplink frequency is 8 GHZ. The downlink frequency will be:
    - (a) higher
    - (b) lower
    - (c) equal
    - (d) either (a) or (b).

    (vi) Polling method of channel allocation is adopted by
    - (a) FDMA
    - (b) CDMA
    - (c) DFDMA
    - (d) none of these.

    (vii) N_o represents noise bandwidth of:
    - (a) 1 KHz
    - (b) 100 Hz
    - (c) 10 Hz
    - (d) 1 Hz.

    (viii) Ionosphere scintillation refers to
    - (a) Faraday rotation
    - (b) amplitude and phase variation
    - (c) Tropo scatter
    - (d) multipath effects.

    (ix) For VSAT, one of the requirement is
    - (a) outdoor antenna
    - (b) Indoor antenna
    - (c) horn antenna
    - (d) Yagi array.

(x) X band spectrum range is:
   (a) 2-4 GHz   (b) 8-12 GHz
   (c) 4-8 GHz   (d) 12-18 GHz.

Group – B

2.(a) Explain, with a diagram, the concept of Look Angle and its significance in Satellite tracking.

(b) Explain, the launch mechanism and placement of Satellite in Geo Orbit.

5+7=12

3.(a) What is meant by orbit perturbations? Explain. Briefly describe the characteristics of
   (i) Polar orbits,   (ii) Molniya orbits

(b) Calculate the apogee and perigee heights for the orbital parameters given as:
   e = 0.00115; a = 7192.3 Kms. Assume earth's mean radius to be 6371 Kms.

3+4+5=12

Group – C

4.(a) Highlight the details of an Earth Station antenna and explain the terms "Gain" & "Pointing Loss".

(b) What do you understand by the word "Transponder"? Explain with a Transponder Model diagram.

6+6=12

5.(a) Derive the up-link and down-link equations for satellite RF communication.

(b) What is frequency selective fading? Explain the effect of rain on antenna noise temperature?

8+4=12

Group – D

6.(a) What is SPADE? Explain its operation. What is the function of common signalling channel?

(b) Explain the DA-TDMA burst structure. How is it different from a simple TDMA burst structure?

6+6=12

7.(a) Explain FDM/FM/FDMA and SSB/FM/FDMA.

(c) Explain how demand assignment may be implemented in a TDMA network. What is the advantage of TDMA over FDMA in this respect?

6+6=12

Group – E

8.(a) What are the various propagation effects and their impact on a satellite Earth Link?

   (b) What is a VSAT and what are its salient features?

8+4=12

9.(a) What is DBS? Explain with diagrams the complete DBS receiver system and give details of the outdoor unit of the same.

   (b) Compare GPS and differential GPS. State at least 3 uses of GPS.

8+4=12