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 × 1 = 10**

(i) INTELSAT stands for
(a) International Telecommunications Satellite
(b) India Telecommunications Satellite
(c) Inter Telecommunications Satellite
(d) International Telephony Satellite.

(ii) Molniya orbit is an orbit with
(a) high eccentricity (b) high inclination
(c) low inclination (d) both (a) and (b).

(iii) 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 them.

(iv) In Satellite Communication, modulation used is
(a) AM (b) PAM
(c) PCM (d) FM.

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

(vi) In designing the uplink, redundancy is used in
(a) HPA (b) mixer
(c) local oscillator (d) none of these.

(vii) The earth station terminal that requires practically no terrestrial interface is represented by
(a) satellite phone (b) DTH terminal
(c) both (a) and (b) (d) gateway terminal.

(viii) Attenuation due to rain of electromagnetic energy is
(a) fixed and predictable
(b) proportional to elevation angle
(c) variable and less predictable
(d) both (b) and (c)

(ix) In GPS system, the satellites orbit in
(a) LEO orbit at approx 500 kms altitude
(b) MEO orbit at approx 20000 km altitude
(c) 55^0 inclination to equator
(d) both (b) and (c).

(x) Satellite DTH systems operate in the
(a) K_U band (b) L Band
(c) K_a band (c) C band.

Group - B

2. (a) With a suitable explanation, arrive at the expression for total C/N ratio plus interference ratio.

(b) Explain the mechanisms of "Transponder Hopping" and " Polarization hopping"

6 + (3 + 3) = 12

3. (a) Explain with details, the communication & power supply subsystems in a Satellite.

(b) What are the main reasons for satellite orbital perturbations?

8 + 4 = 12

Group - C

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

(b) Analyze the working of a transponder with a schematic diagram.

6 + 6 = 12

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5. (a) Derive and explain the basic Satellite Link Design Equation. What are the various loss factors that are taken into consideration?

(b) With a diagram, explain the Satellite Coverage Geometry and explain the terms $\xi,\alpha,\rho,\Theta,d,h,r_e$ etc as required to label the diagram.

(4+2) + 6 = 12

Group – D

6. (a) Identify the salient features of Satellite packet Communication. What is Digital Speech interpolation and how does it help the network?

(b) How is redundancy configuration organized in a Satellite network? Explain with a diagram.

(4+4) + 4 = 12

7. (a) How a DAMA scheme is applied in TDMA? What are its advantages?

(b) Explain the companded FDM-FM-FDMA scheme in details.

7 + 5 = 12

Group - E

8. (a) Explain the working of a VSAT terminal with a diagram.

(b) What do you understand by GPS System? Identify and describe the 3 segments in such a constellation.

6 + 6 =12

9. (a) Explain with a diagram, the MSAT Network concept.

(b) Describe the concept of Direct Broadcast Television and its usage.

6 + 6 =12