B.E. (Elect. & Telecommunication /
Elect. & Communication Engineering) Eighth Semester (C.B.S.)

Elective-III : Satellite Communication

P. Pages : 3 **NRJ/KW/17/4707**

Time : Three Hours * 0 2 6 5 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.

1. a) With neat diagram explain Kepler's three law's of planetary motion. **8**

b) The earth rotates once per sidereal day of 23h 56 min 4.095. Show that the radius of the GEO is 42, 164, 17 km. **6**

OR

2. a) A satellite is in elliptical orbit with a perigee of 1000 km and an apogee of 4000 km. Using a mean earth radius of 6378.14 km, find the period of orbit & eccentricity of the orbit. **4**

b) Explain longitudinal changes and Inclination changes in regards of orbital perturbation with neat sketch. **10**

3. a) Derive an expression for system noise temperature **8**

$$T_s = [T_{in} + T_{RF} + T_m/G_{RF} + T_{IF}/G_m G_{RF}]$$

b) An earth station antenna has a diameter of 30m, has an overall efficiency of 68% and is used to receive a signal at 4150 MHz. At this frequency, the system noise temperature is 79 k when the antenna points at the satellite at an elevation angle of 28º. What is the earth station G/T ratio under these conditions? If heavy rain causes the sky temperature to increase so that the system noise temperature rise to 88k, what is the new G/T value? **5**

OR

4. a) Write short notes on: **13**

1) Satellite uplink design.

2) Satellite downlink design

3) Direct Broadcast TV

5. a) Write short notes on **13**

1) FDMA
2) TDMA, TDMA synchronization & Timing
3) CDMA
4) DAMA

OR

6. a) For a satellite communication system **4**

$(C/N)_{up} = 40\,dB$

$(C/N)_{down} = 40\ dB$

What is the value of overall $(C/N)_0$. If the transponder introduces (C/I) = 48 dB then what is $(C/N)_0$ at the receiving earth station.

b) What is TDMA? What is TDMA frame? Explain TDMA in detail. What is preamble and how it is useful in synchronization? Give the salient features of TDM. **9**

7. a) Write short notes on **any three.** **14**

1) Quantifying Attenuation & Depolarization
2) Atmospheric Absorption
3) Tropospheric scintillation and low noise fading.
4) Rain and Ice effect on satellite wave propagation.

OR

8. a) Explain Rain effect on antenna noise. **4**

b) With neat sketch explain Atmospheric absorption, cloud attenuation and tropospheric scintillation. **5**

c) In regard with propagation impairment count remeasures explain power control and signal processing. **5**

9. a) Write short notes on **any two.** **7**

1) Linear block codes
2) Cyclic codes
3) Channel capacity

b) The parity check matrix of a (7, 4) linear block code is expressed as **6**

$$H = \left[\begin{array}{cccc:ccc} 1 & 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 1 & 0 & 0 & 1 \end{array}\right]$$

obtain generator matrix G & list all code vectors.

OR

10. a) A (7, 4) cyclic code uses generator polynomial $g(x) = x^3 + x^2 + 1$, find the systematic codeward for data 1010, 0101, 1001, 0110 **6**

b) What are convolutional codes? Explain how they are generated. State its advantages over linear block codes. **7**

11. a) Explain the earth station design requirements in detail. **7**

b) Why tracking is required? Explain all the techniques with neat sketch. **6**

OR

12. a) Write short notes on **any three.** **13**

1) LNA
2) HPA
3) RF multiplexing
4) Factors affecting orbit utilization.

****