

Elective - III : Satellite Communication

P. Pages : 2

Time : Three Hours



NKT/KS/17/7569

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) State & explain Kepler's three law's of planetary motion. **6**
- b) Explain six orbital elements with neat diagram. **8**

OR

2. a) With neat sketch explain "Locating satellite in the orbit". Also derive an expression for semi-minor axis & semi-major axis. **5**
- b) What is look angle. Derive an expression for elevation angle with neat sketch. **5**
- c) A satellite is in an 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 the orbit in hours, minutes & secs & eccentricity of orbit. **4**

3. a) Explain system noise temperature & G/T ratio. Also derive an expression for C/N ratio. **7**
- b) A satellite at a distance of 40,000 km from a point on the earth's surface radiates a power of 10w from an antenna with a gain of 17 dB in the direction of the observer. Find the flux density at the receiving point and the power received by an antenna at this point with an effective area of 10 m². **6**

OR

4. a) Explain the design of downlink of satellite communication system. Also derive the expression for power received at the earth station. **7**
- b) A satellite at a distance of 40,000 km from a point on the earth's surface radiates a power of 10w from an antenna with a gain of 17 dB in the direction of observer. Find the flux density. **6**

5. a) Write short notes on **any three** with suitable diagram. 13
 i) TDM, TDMA synchronization & timing.
 ii) FDMA
 iii) CDMA
 iv) On board processing.

OR

6. a) What is meant by intermodulation products ? Explain with mathematical expression. 7
 b) What are the techniques used for spread spectrum transmission ? Explain SS-CDMA transmission & reception using direct sequence pseudo-noise technique. 6
7. a) Explain the effect of atmospheric absorption on satellite communication. 7
 b) Write short notes on Tropospheric scintillation & low angle fading. 6

OR

8. a) Explain rain & Ice effect on satellite communication. 7
 b) Write short note on effect of rain on antenna noise temperature. 6
9. a) Write short notes on **any two**. 7
 i) Channel capacity. ii) Error detecting codes. iii) Linear block codes.

- b) The parity check matrix of (7, 4) linear block code is given by - 7

$$H = \begin{bmatrix} 1 & 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$$

- i) find generator matrix ii) List all code vectors.

OR

10. a) What are convolutional codes ? Explain how they are generated ? State its advantages over linear block code. 7
 b) Construct a decoding table for a single error-correcting (7, 4) cyclic code if the generator polynomial $g(x)$ is $x^3 + x^2 + 1$. If the received codeword is 1101010, find whether it is an error, if yes what is the correct codeword which was transmitted. 7

11. Write short notes on **any three**. 13
 i) HPA ii) LNA
 iii) Factors affecting orbit utilization. iv) RF multiplexing.

OR

12. a) Explain earth station design requirement in detail. 6
 b) What is tracking ? Why tracking is required. Explain all the techniques with neat sketch. 7
