



**B.E DEGREE EXAMINATIONS: APRIL / MAY 2024**

(Regulation 2018)

Seventh Semester

**ELECTRONICS AND COMMUNICATION ENGINEERING**

U18ECE0002: Satellite Communication

**COURSE OUTCOMES**

- CO1:** Discuss orbital mechanics and launch methodologies  
**CO2:** Describe various space subsystems  
**CO3:** Explain different subsystems of earth segment  
**CO4:** Apply signal processing for satellite communication  
**CO5:** Design and analyze link power budget for satellites  
**CO6:** Describe various Satellite Applications

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions:-**

**PART A (10 x 2 = 20 Marks)**

**(Answer not more than 40 words)**

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|---|-----------------------|
| 1. What is sun transit outage?  | CO1 [K <sub>2</sub> ] |
| 2. Specify the orbital parameters required to determine a satellite's orbit.  | CO1 [K <sub>2</sub> ] |
| 3. Determine the gain and beam width of an antenna of diameter 2 m operating at 14GHz. Assume an aperture efficiency of 60%.  | CO2 [K <sub>3</sub> ] |
| 4. List the factors to be considered for earth station site selection.  | CO3 [K <sub>2</sub> ] |
| 5. Summarize the types of modulation schemes employed in satellite communication.   | CO4 [K <sub>2</sub> ] |
| 6. Distinguish between pre-assigned FDMA and demand assigned FDMA.  | CO4 [K <sub>3</sub> ] |
| 7. Calculate the total link loss for clear-sky conditions when a satellite link operating at 14 GHz has receiver feeder losses of 1.5 dB and a free-space loss of 207 dB. The atmospheric absorption loss is 0.5 dB, and the antenna pointing loss is 0.5 dB. Depolarization losses may be neglected. | CO5 [K <sub>3</sub> ] |
| 8. Interpret the effects of rain on satellite link performance.   | CO5 [K <sub>3</sub> ] |
| 9. List the features of VSAT.   | CO6 [K <sub>2</sub> ] |
| 10. Outline any four applications of remote sensing satellite.  | CO6 [K <sub>2</sub> ] |

**Answer any FIVE Questions:-**  
**PART B (5 x 16 = 80 Marks)**  
**(Answer not more than 400 words)**

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|-----|----|--|----|-----|-------------------|
| 11. | a) | State Kepler's laws of orbiting bodies and derive an equation to show that the third law is true for any orbiting satellites.                              | 8  | CO1 | [K <sub>3</sub> ] |
|     | b) | Define look angle. Compute the expressions to determine the look angles for GEO satellites.  | 8  | CO1 | [K <sub>3</sub> ] |
| 12. | a) | Assess how the attitude control is achieved through spin stabilization and momentum wheel stabilization? Give necessary diagrams.                          | 10 | CO2 | [K <sub>3</sub> ] |
|     | b) | Point out the role of Transponder in satellite communication system.   | 6  | CO2 | [K <sub>2</sub> ] |
| 13. | a) | Illustrate the TDMA frame structure used in satellite application with required diagrams. List out the significance of various slots of a frame structure. | 8  | CO4 | [K <sub>2</sub> ] |
|     | b) | Elucidate the principle behind the direct sequence spread spectrum techniques.   | 8  | CO4 | [K <sub>3</sub> ] |
| 14. | a) | Derive the satellite link power budget equations and examine the various interferences that may affect the satellite link performance.                     | 10 | CO5 | [K <sub>3</sub> ] |
|     | b) | Derive the Carrier-to-Noise ratio for the combined uplink and downlink communication.  | 6  | CO5 | [K <sub>3</sub> ] |
| 15. | a) | Illustrate the working of a GPS receiver with a neat sketch and explain how the satellite signal acquisition is made.                                      | 10 | CO6 | [K <sub>2</sub> ] |
|     | b) | Discuss the principle of DTH system with the help of neat diagrams. List the design issues to be considered.   | 6  | CO6 | [K <sub>2</sub> ] |
| 16. | a) | Explain the principle of MATV & CATV systems.  | 8  | CO3 | [K <sub>2</sub> ] |
|     | b) | Point out the salient features of INTELSAT and INMARSAT.   | 8  | CO6 | [K <sub>2</sub> ] |

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