

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION)**

**CLASS: BTECH  
BRANCH: ECE**

**SEMESTER : VII  
SESSION : MO/2024**

**SUBJECT: EC417R1 SATELLITE COMMUNICATION**

**TIME: 3 Hours**

**FULL MARKS: 50**

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data handbook/Graph paper etc. to be supplied to the candidates in the examination hall.
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|        |   | CO        | BL        |
|--------|---|-----------|-----------|
| Q.1(a) | Discuss the factors responsible for orbital inclination in a geostationary satellite. How is the inclination of a geostationary communication satellite corrected?  | [5] 1     | 1,2       |
| Q.1(b) | What is Molniya orbit? A satellite moving in a highly eccentric Molniya orbit having the farthest and the closest points as 35,000 km. and 500 km. respectively from the surface of the earth. Determine the orbital time period and the velocity at the apogee and perigee points. $R_E = 6370$ Km, and $\mu = 3.986 \times 10^5$ Km <sup>3</sup> /S <sup>2</sup>  | [5] 1     | 1,2,3     |
| Q.2(a) | Differentiate between C/N and G/T ratio. What is the downlink-limited condition? How G/T for a small and a large earth station can be optimized.  | [5] 2,3   | 1,2       |
| Q.2(b) | An earth station transmits at 5.62 GHz from an antenna of 6 m. The transmitter generates an output of 8 kW. The satellite is 39920 Km. from the earth station. The efficiency of the transmitting antenna being 0.7. Calculate (i) Path loss (ii) Transmitting antenna gain (iii) EIRP in dBW (iv) Received power at the satellite (v) Improvement in received power if the satellite uses a parabolic dish of 2.5 m. | [5] 2,3   | 1,2,3     |
| Q.3(a) | Explain the characteristics of spot beam coverage and global coverage antennas used in satellite communication. At the ground station receiver, which parameters are responsible for optimizing the received power?   | [5] 2,3,5 | 2,3       |
| Q.3(b) | An antenna has a gain of 46 dB at 12 GHz. Calculate its effective area. Calculate the gain of a 3 m reflector antenna at (a) 6 GHz and (b) 14 GHz.  | [5] 2,3,5 | 1,2,3,4,5 |
| Q.4(a) | Compare SCPC and MCPC techniques in FDMA system. What are the parameters on which S/N of a telephone channel at the top FDM baseband frequency $f_m$ depends on, in a FDM_FM_FDMA system?   | [5] 2,3,4 | 1,2       |
| Q.4(b) | With the help of a suitable example show that signal transmitted using spread spectrum technique is immune to narrow and wide band interferences. Why it is difficult to recover the transmitted signal if the code is unknown to the receiver?   | [5] 2,3,4 | 1,2,3,4,5 |
| Q.5(a) | Differentiate between the SPS and PPS of GPS services. Explain the concept of the GPS system. How the accuracy of the GPS can be enhanced?  | [5] 4,5   | 1,2       |
| Q.5(b) | What are the various elements of a VSAT network? Discuss the various applications of VSAT system? How it differs from MSAT?   | [5] 4,5   | 1,2       |

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