Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**M. E. Sem. – II$^{nd}$ - Examination – June/July- 2011**

**Subject code: 1710418**

**Subject Name: Satellite Communication**

**Date:04/07/2011** **Time: 10:30 am – 01:00 pm**

**Total Marks: 70**

## Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

| | | | |
|---|---|---|---|
| **Q.1** | **(a)** | State Kepler's three laws of planetary motion. Illustrate in each case their relevance to artificial satellites orbiting the earth. | **07** |
| | **(b)** | With the aid of a neat sketch, explain what is meant by each of the angles: inclination, argument of perigee, right ascension of the ascending node. Which of these angles would you expect , in general, to change with time? | **07** |
| **Q.2** | **(a)** | Determine the maximum possible longitudinal separation which can exist between a geostationary satellite and an earth station while maintaining line-of-sight communications, assuming the minimum angle of elevation of the earth station antenna is 5° .State also the latitude of the earth station. | **07** |
| | **(b)** | An earth station is located at latitude 12° S and longitude 52° W. Calculate the antenna -look angles for a satellite at 70° W. | **07** |
| | | **OR** | |
| | **(b)** | An earth station is located at latitude 30° S and longitude 130° E. Calculate the antenna -look angles for a satellite at 156° E. | **07** |
| **Q.3** | **(a)** | Describe the TT&C facilities of a satellite communications system. | **07** |
| | **(b)** | Describe the east-west and north-south station –keeping maneuvers required in satellite station keeping. | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | Briefly describe the equipment sections making up a transponder channel. | **07** |
| | **(b)** | Define and explain 1-dB compression point. What is the significance of this point in relation to operating point of a TWTA? | **07** |
| **Q.4** | **(a)** | Describe and compare MATV and CATV systems. | **07** |
| | **(b)** | With the aid of a block schematic, describe the functioning of a transmit-receive earth station used for telephone traffic. Describe a multidestination carrier. | **07** |
| | | **OR** | |

**Q.4** **(a)** A satellite circuit has the following parameters : **07**

| | Uplink,decilogs | downlink,decilogs |
|---|---|---|
| [EIRP] | 54 | 34 |
| [G/T] | 0 | 17 |
| [FSL] | 200 | 198 |
| [RFL] | 2 | 2 |
| [AA] | 0.5 | 0.5 |
| [AML] | 0.5 | 0.5 |

Calculate the overall [C/No] value.

**(b)** Describe briefly the modes of interference that can occur in a satellite communications system. **07**

**Q.5** **(a)** The downlink of a satellite circuit operates at a satellite [EIRP] of 35dBW and a receiving antenna gain of 59.5 dB. Interference is produced by a satellite spaced 3°,its [EIRP] also being 35dBW.Calculate the [C/I] ratio at the receiving antenna assuming 6-dB polarization discrimination .The sidelob gain function for the earth-station antenna is 32-25 logθ . **07**

**(b)** Describe the general operating principles of a TDMA network. Show how the transmission bit rate is related to the input bit rate. **07**

**OR**

**Q.5** **(a)** Explain in detail the operation of the Spade system of demand assignment. What is the function of the common signaling channel? **07**

**(b)** Draw accurately to scale the transponder frequency plan for the DBS transponders 5,6 and 7 for uplink and downlink. **07**

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