Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**M. E. - SEMESTER – II • EXAMINATION – WINTER 2012**

**Subject code: 1710418** **Date: 02/01/2013**

**Subject Name: Satellite Communication**

**Time: 02.30 pm – 05.00 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 laws of planetary motion. What is Kepler's constant. Derive the equation for orbital period of satellite. | **07** |
| | **(b)** | Explain Prograde and Retrograde with a neat sketch. | **04** |
| | | A satellite is an 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 orbital period in hh:mm:ss.ss<br>Take $\mu = 3.986004418 * 10^5$ $km^3/s^2$ | **03** |
| **Q.2** | **(a)** | What is attitude control? Name and explain one method each used for passive attitude control and active attitude control. | **07** |
| | **(b)** | Explain with neat sketch Universal Time and Sidereal time. Out of mean solar day and mean sidereal day which one is greater? | **07** |
| | | **OR** | |
| | **(b)** | Explain with neat sketch earth eclipse of satellite and sun transit outage. What are the typical durations of each? | **07** |
| **Q.3** | **(a)** | Find $[C/No]_{DL}$ of a satellite link operating at 12 GHz given following parameters:<br>• EIRP of satellite = 48dBW<br>• Antenna Pointing Loss = 1dB<br>• Atmospheric absorption loss = 3 dB<br>• Receiver G/T = 19.5 dB/K<br>• Receiver feeder loss = 1 dB<br>• Free space loss = 206 dB<br>Calculate $E_b/No$ assuming bitrate = 10 MHz | **07** |
| | **(b)** | Define and explain 1 dB compression point. Explain in relation to operating point of a TWTA. | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | For a satellite circuit, the carrier-to-noise ratios are uplink 23 dB, downlink 20 dB and intermodulation 24 dB. Calculate the overall carrier-to-noise ratio in decibels. | **07** |
| | **(b)** | Describe TT & C facilities of a satellite communication system. | **07** |
| **Q.4** | **(a)** | Describe and compare MATV and CATV systems. | **07** |
| | **(b)** | Write short notes on following:<br>(a) Hohmann Transfer Orbit<br>(b) Satellite switched TDMA | **07** |
| | | **OR** | |
| **Q.4** | **(a)** | Explain working of a transponder with the help of suitable block | **07** |

diagram and typical relative levels.

**(b)** Explain Network Synchronization in TDMA system. **07**

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

**(b)** Give advantages and disadvantages of TDMA and FDMA systems. **07**

**OR**

**Q.5** **(a)** What is the function of Unique Word with respect to TDMA? Explain unique word detection circuit with the help of block schematic. **07**

**(b)** Explain Reference burst in TDMA system. **07**

Calculate frame efficiency of a TDMA network given following parameters.
Total frame length = 120,832 symbols
Traffic burst per frame = 14
Reference Burst per frame = 2
Guard Interval = 103 symbols

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