Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER 2012

Subject code: 710418N Date: 11-01-2013

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)**	Explain Kepler's first, second and third law of planetary motion Also explain why there is only one geostationary orbit?	**07**
	(b)	Briefly describe functional block diagram of the communication transponder. Explain why de-multiplexer and multiplexers are used ?	**07**
Q.2	**(a)**	Explain what is meant by the earth eclipse of an earth orbiting satellite . Why is it preferable to operate with a satellite positioned at West, rather than East ,of an earth station longitude?	**07**
	(b)	Describe the TT&C facilities of a satellite communication system. What should be the radiation pattern of antenna used for TT&C during launch phase?	**07**
		OR	
	(b)	What do you mean by Polar Mount Antenna. Determine the angle of tilt required for a polar mount used with earth station at latitude 49 degree North .Assume spherical earth of mean radius 6371 km and ignore earth station altitude. Given that radius of satellite orbit 42164 km.	**07**
Q.3	**(a)**	With the aid of a block diagram, describe the functioning of transmit–receive earth station of satellite communications ,used for telephone traffic	**07**
	(b)	Explain what is meant by satellite attitude control , briefly describe two forms of attitude control?	**07**
		OR	
Q.3	**(a)**	With the aid of block diagram, explain why the LNA in a satellite receiving system is placed at the antenna end of the feeder cable. Is it also desirable to put down convertor at this location?	**07**
	(b)	What methods are used to improve the transponder capacity in relation to Direct Broadcasting System of TV signals?	**07**
Q.4	**(a)**	Briefly describe TDMA system. What are the functions of preamble and unique word in TDMA frame?	**07**
	(b)	For a satellite circuit the individual link carrier to noise spectral density ratios are: uplink 100 dBHz; downlink 87 dBHz . Calculate the combined C/N0(carrier to noise density) ratio?	**07**
		OR	
Q.4	**(a)**	Briefly describe the pre-assigned and demand assigned FDMA system?	**07**
Q.4	**(b)**	The saturation value of EIRP is 25 dBW for satellite down link . The output amplifier is operated at 6 dB output back-off; free space loss ,196 dB; other downlink losses are, 1.5 dB; and earth station G/T is 41 dB/K . Calculate the carrier to noise ratio at the earth station. Boltzmann's	**07**

constant k =228.6 dB/degree K

Q.5 **(a)** Explain **Any two** (i) Sidereal time (ii) Thermal control in spacecraft (iii) System noise temperature (iv) SPADE System **07**

(b) What do you understand by Line of Apsides and Argument of perigee of the satellite orbit. Calculate the semi major axis of an orbit for which the period is 12 hours. Given Earth gravitational constant $\mu = 3{,}986005 \times 10^{14}$ m^3/s^2 **07**

OR

Q.5 **(a)** What is frame efficiency in a TDMA system. In a TDMA network the reference burst and preamble each requires 560 bits and the nominal guard interval between burst is 120 bits . Given that there are eight traffic burst and one reference burst per frame. Total frame length is equivalent to 40800 bits , Calculate the frame efficiency? **07**

(b) Discuss onboard signal processing for FDMA/TDM operation In what ways it is advantageous compared to transparent transponder? **07**

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