Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–VII • EXAMINATION – WINTER • 2014

Subject Code: X 71104 **Date: 05-12-2014**

Subject Name: Satellite Communication

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)** A satellite is 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 period of the orbit in hours, minutes, and seconds, and the eccentricity of the orbit. **07**

(b) A geostationary satellite is located at 90°W. Calculate the azimuth angle for an earth-station antenna at latitude 35°N and longitude 100°W. Also find the range and antenna elevation angle. **07**

Q.2 **(a)** 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 **07**

(b) State Kepler's three laws of planetary motion. Explain orbital perturbations related to nonspherical earth. **07**

OR

(b) Describe communication subsystems of the satellite. **07**

Q.3 **(a)** A multiple carrier satellite circuit operates in the 6/4-GHz band with the following characteristics. **07**

Uplink: Saturation flux density: -67.5 dBW/m^2; input backoff: 11 dB; satellite G/T: -11.6 dBK^{-1}

Downlink: Satellite saturation EIRP: 26.6 dBW; output backoff: 6 dB; free-space loss: 196.7 dB; earth station G/T: 40.7 dBK^{-1}.

Calculate the carrier-to-noise density ratios for both links and combined value. Ignore other losses.

(b) Answer the followings: **07**

1. Explain what is meant by amplifier noise temperature and system noise temperature referred to input.
2. What is spin stabilization?

OR

Q.3 **(a)** Define EIRP and discuss basic transmission theory to calculate the power received by an earth station from a satellite transmitter. **07**

(b) Solve the followings examples: **07**

1. Two amplifiers are connected in cascade, each having a gain of 10 dB and a noise temperature of 200 K. Calculate the overall gain and the effective noise temperature referred to input.
2. Thermal noise in an earth station receiver results in a $(C/N)_{dn}$ ratio of 20 dB. A signal is received from a bent pipe transponder with a carrier to noise ratio $(C/N)_{up}$ = 20 dB. If the transponder introduces intermodulation products with (C/I) ratio = 24 dB, what is the overall (C/N) ratio at the receiving earth station?

Q.4 **(a)** Discuss FDMA in relation to a satellite communications network. **07**

	(b)	Describe (1) sun synchronous orbit (2) Iridium system.	**07**
		OR	
Q.4	**(a)**	Write short note on DAMA (demand access multiple access)	**07**
	(b)	Discuss propagation effects that are not associated with raindrops or ice crystals.	**07**
Q.5	**(a)**	Explain fundamental concept behind most VSAT systems and describe basic VSAT network architectures.	**07**
	(b)	State briefly the areas of applications for which you feel satellite communication system is best suited. Write brief note on GPS.	**07**
		OR	
Q.5	**(a)**	Draw and explain block diagram of a DBS-TV receiver.	**07**
	(b)	Explain general arrangement of position locations with GPS in detail.	**07**

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