

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/m²; 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**
