

GUJARAT TECHNOLOGICAL UNIVERSITY**PDDC - SEMESTER-VII • EXAMINATION – SUMMER 2013****Subject Code: X 71104****Date: 20-05-2013****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)** Answer the followings: **07**
- (i) Which features are offered by Satellites that are not readily available with other means of communications?
 - (ii) Compare LEO, MEO and GEO satellite orbits.
- (b)** State and explain Kepler's three laws for planetary motion. **07**
- Q.2 (a)** Define the following terms related to Earth-Orbiting Satellites: **07**
- (i) Inclination
 - (ii) Prograde orbit
 - (iii) Retrograde orbit
 - (iv) Argument of perigee
 - (v) Right ascension of ascending node
 - (vi) Mean anomaly
 - (vii) True anomaly
- (b)** Solve the following examples: **07**
1. A satellite in geostationary orbit has an apogee height of 35,795 km and a perigee height of 35,779 km. Assuming a value of 6378 km for the earth's equatorial radius; determine the semi-major axis and the eccentricity of the satellite's orbit.
 2. Determine the angle of tilt required for a polar mount used with an earth station at latitude 49 degrees north. Assume a spherical earth of mean radius 6371 km, and ignore earth station altitude.

OR

- (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**
- Q.3 (a)** What is meant by attitude control? Describe telemetry, tracking, and command in satellite communication system. **07**
- (b)** Explain in brief (1) antenna noise temperature and (2) system noise temperature referred to input. **07**
- An LNA is connected to a receiver which has a noise figure of 12 dB. The gain of the LNA is 40 dB, and its noise temperature is 120 K. Calculate the overall noise temperature referred to the LNA input. Also justify that for a cascaded amplifier system, the first stage LNA has high power gain and low noise temperature.

OR

- Q.3 (a)** Write a brief technical note on different types of losses occurring in a space link case and write the steps to be followed for uplink power **07**

budget preparation.

- (b) Answer the followings: 07
- (i) What is meant by saturation flux density for a TWT amplifier? Explain input back-off and output back-off for satellite TWT amplifier.
 - (ii) The EIRP from a satellite is 49.4 dBW. Calculate (1) the power density at a ground station for which the range is 40,000 km and (2) the power delivered to a matched load at a ground station receiver if the antenna gain is 50 dB. The downlink frequency is 4 GHz.
- Q.4 (a)** Explain combined uplink and downlink C/N ratio. For a satellite circuit the individual link carrier-to-noise spectral density ratios are: uplink C/N_0 ratio is 100 dBHz; downlink value is 87dBHz. Calculate the combined C/N_0 ratio. 07
- (b) Distinguish between pre-assigned and demand-assigned traffic in relation to a satellite communications network. Describe the operation of the Spade system of demand assignment. 07
- OR**
- Q.4 (a)** Answer the followings: 07
- (i) Discuss propagation effects which are not associated with hydrometer in brief.
 - (ii) What is XPD? How XPD are predicted?
- (b) Describe on-board signal processing for FDMA/TDM operation. 07
- Q.5 (a)** Describe operational NGSO constellation design. 07
- (b) Write note on error control in Digital DBS-TV. 07
- OR**
- Q.5 (a)** Explain why a minimum of four satellites must be visible at any earth location utilizing the GPS system for position determination. Also describe the operation of GPS receiver in brief. 07
- (b) Describe the architecture and operation of a VSAT system. 07
