

GUJARAT TECHNOLOGICAL UNIVERSITY
ME Semester –I Examination Feb. - 2012

Subject code: 710418N**Date: 16/02/2012****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) State Kepler's three laws of planetary motion. Illustrate in each case their relevance to artificial satellites orbiting the earth. **07**
- (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 . **04**
- (c) Explain briefly what is meant by sun transit outage. **03**

- Q.2** (a) Explain what is meant by satellite attitude, and briefly describe two forms of attitude control. **07**
- (b) A satellite has an inclination of 90° and an eccentricity of 0.1. At epoch, which corresponds to time of perigee passage, the perigee height is 2643.24 km directly over the north pole. Determine (a) the satellite mean motion. For 1 day after epoch determine (b) the true anomaly, (c) the magnitude of the radius vector to the satellite. **07**

OR

- (b) The orbit for an earth-orbiting satellite has an eccentricity of 0.15 and a semimajor axis of 9000 km. Determine (a) its periodic time; (b) the apogee height; (c) the perigee height. Assume a mean value of 6371 km for the earth's radius. **07**
- Q.3** (a) With necessary equations describe transmission losses in detail. **07**
- (b) Describe the east-west and north-south station-keeping maneuvers required in satellite station keeping. What are the angular tolerances in station keeping that must be achieved? **04**
- (c) Define and explain the terms roll, pitch, and yaw. **03**

OR

- Q.3** (a) Explain briefly: (1) Preassigned FDMA **07**
 (2) Demand assigned FDMA
- (b) Explain what is meant by the G/T ratio of a satellite receiving system. satellite receiving system employs a 5-m parabolic antenna operating at 12 GHz. The antenna noise temperature is 100 K, and the receiver front-end noise temperature is 120 K. Calculate [G/T]. **07**
- Q.4** (a) With diagram explain the functioning of a satellite switched TDMA. **07**
- (b) Explain what is meant by noise factor. The noise factor of an amplifier is 7:1. Calculate (a) the noise figure and (b) the equivalent noise temperature. **07**

OR

- Q.4** (a) Explain what is meant by (a) antenna noise temperature, (b) amplifier noise temperature, and (c) system noise temperature referred to input. A system operates with an antenna noise temperature of 40 K and an input amplifier noise temperature of 120 K. Calculate the available noise power density of the system referred to the amplifier input. **07**
- (b) Define and explain following terms with respect to satellite communication (i) Julian dates (ii) Sidereal time (iii) Mean solar day **07**
- Q.5** (a) Determine the maximum possible longitudinal separation which can exist between a geostationary satellite and an earth station while maintaining line-of-sight communications, assuming the minimum angle of elevation of the earth station antenna is 6° . State also the latitude of the earth station. **07**
- (b) Calculate the gain of a 3 m paraboloidal antenna operating at a frequency 12 GHz. Assume an aperture efficiency of 0.55 **04**
- (c) State the type of satellite antenna normally used to produce a widebeam radiation pattern, providing global coverage. How are spot beams produced? **03**
- OR**
- Q.5** (a) Describe briefly the modes of interference that can occur in a satellite Communications system. Distinguish carefully between satellite and terrestrial modes of interference. **07**
- (b) Describe and compare MATV and CATV systems. **07**
