

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-II Examination July 2010

Subject code: 710418

Subject Name: Satellite Communication

Date: 10 / 07 /2010

Time: 11.00am – 1.30pm

Total Marks: 60

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Define the following terms: **06**
 (i) Apogee (ii) Perigee (iii) Inclination
- (b) State Kepler's three laws of planetary motion. **06**
- Q.2** (a) Explain why there is only one geostationary orbit. Derive the equation to find range of a geostationary satellite from an earth station in terms of Earth's radius, height of geostationary orbit above the equator and elevation angle of earth station antenna. **06**
- (b) An earth station is located at latitude 30° S and longitude 130° E. Calculate the antenna-look angles for a satellite at 156° E. **06**
- OR**
- (b) Calculate for your home location the look angles required to receive from the satellite immediately east of your longitude. **06**
- Q.3** (a) A geostationary satellite stationed at 90° W transmits a vertically polarized wave. Determine the polarization of the resulting signal received at an earth station situated at 70° W, 45° N. **06**
- (b) Briefly describe the three-axis method of satellite stabilization. **06**
- OR**
- Q.3** (a) Draw to scale the uplink and downlink channeling schemes for a 500 MHz bandwidth C-band satellite, accommodating the full complement of 36-MHz bandwidth transponders. Assume the use of 4 MHz guard bands. **06**
- (b) Explain what is meant by thermal control and why it is necessary in a satellite. **06**
- Q.4** (a) Describe and compare MATV and CATV systems. **06**
- (b) Describe the antenna subsystem in the space segment. **06**
- OR**
- Q.4** (a) Calculate the gain of a 3-m parabolic reflector antenna at a frequency of 6 GHz and 14 GHz. **06**
- (b) Define noise factor. The noise factor of an amplifier is 7:1. Calculate noise figure and equivalent noise temperature. **06**
- Q.5** (a) Explain what is meant by carrier-to-noise ratio? At the input to a receiver, the received carrier power is 40 pW and the system noise temperature is 450 K. Calculate the Carrier-to-noise density ratio in dBHz. Given the bandwidth of 36 MHz, calculate C/N ratio in dB. **06**
- (b) Explain the need for a reference burst in a TDMA system. **06**
- OR**
- Q.5** (a) Explain input and output back-off in power amplifier. **06**
- (b) The EIRP of each earth station in an FDMA network is 47 dBW and the input data rate are at the T1 bit rate with 7/8 FEC added. The downlink bit rate is limited to a maximum of 60 Mbps with 6-dB output back-off applied. Compare the EIRP needed for the earth station in a TDMA network utilizing the same transponder. **06**
