Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech(ECE)/SEM-2/MCE-205A/2013

2013

SATELLITE COMMUNICATION

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer *all* questions : 7 × 2 = 14

   i) What are the two angles used to point a ground station antenna ?

   ii) Why intermodulation products is important in FDMA system ?

   iii) Explain what is Effective Isotropic Radiated Power (EIRP).

   iv) Justify spot beam antenna is a better choice than earth coverage antenna.

   v) Justify Klystron amplifier is better in performance compared to TWTA but bandwidth is very poor.

   vi) Justify in frequency reuse orthogonal polarization can be applied.

   vii) Justify in a TDMA system carrier and clock recovery sequence regenerates the bit timing clock for data demodulation.

Answer any *four* of the following. 4 × 14 = 56

2. a) Draw a neat block diagram showing the typical architecture of satellite earth station.

   b) Explain with a neat diagram the operation of a TWTA used in satellite earth station.

   c) Discuss briefly the redundancy configuration employed in TWTA in earth station. 3 + 8 + 3

3. a) What is the difference between FDM and FDMA ?

   b) For a FDM-FM-FDMA system derive necessary steps to find the expression for C/N = (S/N) (b/B) $\left(f_m / f_r\right)^2$. Where S, N, b, B, f_m and f_r have their respective meaning. 4 + 10

4. a) What is meant by frequency reuse ? 2

   b) With a schematic block diagram discuss the frequency reuse technique used in satellite communication system using multichannel multi-beam satellite transponder. What are its advantages ? 9 + 3

5. a) Draw the block diagram of a typical communication subsystem of a satellite. 4

   b) Why uplink frequency is greater than the downlink frequency ? What is the footprint of a satellite ? What is spot beam antenns ? 3 + 2 + 2

   c) Calculate the power gain of a parabolic reflector antenna with a mouth diameter of 10 m at 6 GHz assumes antenna aperture efficiency to be 80%. 3

6. a) What is the difference between a geosynchronous satellite and a geostationary satellite ? What is perigee of a satellite ? 2 + 1

   b) Explain with diagram the sun transit outage of a satellite signal. 4

   c) From basic transmission theory, find out the link equation; hence point out terms EIRP and free space path loss in dB form. 7

7. a) What is the full form of LNBC ? Explain its function with block diagram. 1 + 2

   b) Explain atmospheric effects on satellite communication link. 6

   c) State features and application of VSAT. 3

   d) Explain rain attenuation of satellite communication system. 2