Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech(ECE)/SEM-2/MCE-205A/2012

2012

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.

Answer Question No. 1 and any *four* from the rest.

1. Answer any *five* questions : 5 × 2 = 10

   i) Which satellite system is known as Irridium satellites and why ?

   ii) What are the conditions for a perfect geostationary orbit of a satellite ?

   iii) What do you mean by ascending and descending nodes ?

   iv) How many types of satellite orbits do you know based on inclination ?

   v) What is meant by frequency reuse ?

   vi) The range between a ground station and a satellite is 42000 km. Calculate the free space loss at frequency of 6 GHz.

   vii) Define frame efficiency.

   viii) What is PDOP ?

2. a) Draw a neat block diagram of basic satellite system. 3

   b) Discuss LEO, MEO, GEO and HEO satellite systems. 12

3. a) Define orbital period and orbital velocity for satellite and deduce expression for it. 6

   b) What are the three Keplar's laws ? Give their statements with mathematical expression. 6

   c) An shuttle is orbiting at an radius of 270 km above earth's surface in circular orbit. Calculate its period. (Mean earth's radius is approximately 6378 km) 3

4. a) What is a Link Budget ? Write steps to make a good Link Budget. 2 + 4

   b) What do you mean by system Noise temperature ? Explain with the help of an example how system Noise temperature is calculated with the noise model. 3 + 6

5. a) What are transponders ? Discuss types of transponders you know with the help of neat block diagrams. 1 + 6

   b) Discuss footprint categories of satellite antenna you know. 4

   c) Define roll, pitch and yaw axis. 4

6. a) What is meant by intermodulation disortion ? Derive the expression of it and explain. What precaution will you take to avoid intermodulation noise ? 2 + 6 + 3

   b) Discuss Asynchronous TDM in short. 4

7. a) Deduce expression for elevation angle. 6

   b) What are the conditions to make satellite visible ? 3

   c) Typical minimum elevation angles used by earth stations operating in commercial fixed services using satellite communications are as follows :

   C band 5°, *Ku* band 10°, *Ka* band 20°.

   i) Determine the minimum and maximum range in km from an earth station to a geostationary satellite in the 3 bands.

   ii) To what round-trip signal propagation times do this range corresponds ?

   (Assuming signal propagation with velocity of light) 3 + 3

8. a) What is GPS stands for ? Discuss all the segments of GPS system. 1 + 6

   b) Discuss working of GPS. 8

9. Write short notes on any *three* of the following : 3 × 5

   a) Effect of rain on satellite communication

   b) Satellite launching systems

   c) VSAT

   d) Orbital effects in communication systems performance.