(Following Roll No. to be filled by candidate)	
Roll No.	

M TECH
THIRD SEMESTER EXAMINATION 2015-2016
DCE42
SATELLITE COMMUNICATION

Time: 3 Hours **Max. Marks: 100**

Note: Attempts all Questions. All Questions carry equal marks.

1. Attempt any FOUR questions. [4 x 5]

   a. Explain the step by step process of placement of satellite in geostationary orbit.
   b. Give the kepler's three laws of planetary motion. Give the difference between geosynchronous and geostationary orbit.
   c. Define the following terms related to satellite
      1. Look angle.
      2. Azimuth angle.
      3. Sub satellite point.
   d. Explain orbital perturbations. Give the brief description of expendable launch vehicle.
   e. Explain attitude and orbit control system.
   f. Explain the following terms
      i. Sun transit outage
      ii. Apogee and perigee.
      iii. Ascending and descending node.

2. Attempt any four questions. [4X 5]

   a. Explain communication and power subsystem in detail.
   b. Explain simplified double conversion transponder (bent pipe) for 14/11 GHz band.
   c. What is EIRP? What is noise figure and noise temperature.
   d. What do you mean by link budget of satellite?
   e. Draw and explain the block diagram of earth station.
   f. Thermal noise in an earth station receiver results in a $(C/N)_{dn}$ ratio of 20.0 dB. A signal is received from a bent pipe transponder with a carrier to noise ratio $(C/N)_{up}$ = 20.0 dB. What is the value of overall $(C/N)_0$ at the earth station? If the transponder introduces intermodulation products with (C/I) ratio = 24 dB, what is the overall $(C/N)_0$

3. Attempt any two questions. (2X 10= 20)

   a. Drive overall (C/N) for complete link design.
   b. A geostationary satellite carries a transponder with a 20 W transmitter at 4 GHz. The transmitter is operated at an output power of 10 W and

drives an antenna with a gain of 30 dB. An earth station is at the center of the coverage zone of the satellite, at a range of 38500 km. Using decibels for all calculations find

i. The flux density at the earth station in dBW/m^2 .
ii. The power received by an antenna with a gain of 39 dB, in dBW.
iii. The EIRP of the transponder in dBW.

c. A transponder of a ku band satellite has a linear gain of 127 dB and a nominal output power at saturation of 5 W. The satellite's 14 GHz receiving antenna has a gain of 26 dB on axis, and the beam covers western Europe.
Calculate the power output of an uplink transmitter that gives an output power of 1W from the satellite transponder at a frequency of 14.45 GHz when the earth station antenna has a gain of50 dB and there is a 1.5 dB loss in waveguide run between the transmitter and antenna. Assume that the atmosphere introduces a loss of 0.5 dB under clear sky conditions and that the earth station is located on the -2 dB contour of the satellite's receiving antenna. If rain in the path causes attenuation of 7 dB for .001% of the year, what output power rating is required for the transmitter to guarantee that a 1-W output can be obtained from the satellite transponder for 99.99% of the year if the uplink power control is used?
Assume a path length of 38,500 km.

4. Attempt any two questions. [2X10]

a. Explain TDMA frame structure in detail. Give the features of TDMA. What is frame efficiency and channel capacity in TDMA.
b. Explain satellite switched TDMA with onboard processing. What is DAMA.
c. Explain CDMA and GPS in detail

5. Attempt any four questions. [4X5]

Write short notes:.

a. GSM.
b. VSAT
c. DBS TV
d. Molniya orbit and equatorial orbits.
e. Differential GPS
f. FDMA.