(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : **131751**

Roll No. ☐☐☐☐☐☐☐☐☐☐

B. Tech.

(SEM. VII) (ODD SEM.) THEORY EXAMINATION, 2014-15

SATELLITE COMMUNICATION

Time : 3 Hours]   [Total Marks : 100

Note :   (1)   Attempt ALL questions.

(2)   All questions carry equal marks.

(3)   Assume any missing data.

1   Attempt any four parts of the following :   5×4=20

(a)   What are the elements of satellite communication? Explain each of them with a suitable block diagram.

(b)   What is meant by look angles? Explain them with reference to a GEO satellite and earth station.

(c)   Satellite-1 in an elliptical orbit has the orbit semi-major axis equal to 18000 km and Satellite-2 has semi-major axis equal to 24000 km. Determine the relationship between their orbital periods.

(d)   A satellite moving in a highly eccentric Molniya orbit has the farthest and the closest distance points as 35000 km and 500 km respectively from the surface of the earth. Determine the orbital time period and the velocity at the apogee and perigee points.

(e) Explain the different types of antennas used in a satellite system.

(f) Explain how a satellite is placed into a Geostationary orbit.

2 Attempt any four parts of the following :   5×4=20

(a) What are the factors that affect the uplink design and the downlink design in geostationary satellites?

(b) Derive the general link equation. Find out the expression for C/N and G/T ratio.

(c) What do you understand by system noise temperature? Derive the relation for equivalent system noise temperature.

(d) Determine the power received by a satellite located at 40000 km from the surface of earth. Satellite is operating at a frequency of 11 GHz and has EIRP of 21 dB W. The gain of the receiving antenna is 50.5 dB.

(e) Briefly discuss the various satellite subsystems. Explain TTC and antenna subsystem in detail.

(f) A satellite carrying a 11.7 GHz continuous wave (CW) beacon transmitter is located in geosynchronous orbit 38000 km from an earth station. The beacon's output power is 200 mW, and it feeds an antenna with 18.9 dB gain towards the earth station. The earth station receiving antenna aperture efficiency is 50 percent. The effective aperture area is 10 sq.mt. Calculate:

(1) EIRP
(2) Path-loss.
(3) Receiving antenna gain.

3 Answer any two parts of the following :   10×2=20

(a) Explain rain attenuation and rain depolarization in detail with suitable diagrams.

131751]   2   [Contd...

(b) How atmospheric absorption and depolarization affect the propagation on satellite-earth path? Explain in detail.

(c) With the help of a suitable diagram, explain satellite communication system architecture using VSAT. Also write the applications of VSAT.

4   Answer any two parts of the following :   10×2=20

(a) State and explain the different segments of GPS. What is meant by satellite signal acquisition in GPS?

(b) With the help of a suitable block diagram, explain the working of DBS Television network in detail.

(c) Explain the position determination principle of GPS. Also draw the block diagram of a GPS receiver and explain its working.

5   Answer any two parts of the following :   10×2=20

(a) Discuss the evolution of satellites for mobile communication system (MSB).

(b) Discuss the various types of antenna used for mobile satellite broadcasting. What are their technical requirements?

(c) Write short notes on any two of the following:
   (i)   Wire Quadrifilar Helical Antenna (WQHA)
   (ii) Phase array antenna
   (ii) Frequency reuse.

_____