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Question Paper Code: 52221

M.E. DEGREE EXAMINATION, JUNE 2016

Second Semester

Communication Systems

15PCM201 - SATELLITE COMMUNICATION

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 20 = 100 Marks)

1. (a) (i) State Kepler's laws as applied to satellite communications. Briefly describe the orbital parameters with the help of diagrams. (15)
- (ii) Describe the various satellite services with frequency band designations. (5)

Or

- (b) (i) Bring out the differences between LEO, MEO and GSO satellites. Mention about their applications. (10)
 - (ii) What are the functions of TT and C subsystem? Explain the function of a satellite control system with a neat block diagram. (10)
2. (a) (i) With a neat block diagram, explain the CDMA transmitter and receiver with direct sequence spread spectrum. Obtain the capacity equation of CDMA system and compare it with TDMA system. (10)
 - (ii) Explain in detail about the features of tracking and data relay satellite. (10)

Or

- (b) (i) With a block diagram discuss the principles of operation of frequency division and time division multiple access schemes. Bring out their advantages and limitations. (10)

(ii) A 14 GHz uplink operates with transmission losses 212 dB and a satellite $[G/R] = 10 \text{ dB/k}$. The required uplink $[Eb/No]$ is 12 dB.

(1) Assuming FDMA operation and uplink gain of 46 dB, find the earth station T_x . Power needed for T , baseband signal rate 1.544 Mb/s, Boltzmann's constant $k = 1.38 \times 10^{-23} \text{ J/K}$

(2) If the downlink transmission rate is 74 dBb/s find the uplink power increase required for TDMA (10)

3. (a) (i) Starting with first principles, obtain the link design equation with and without frequency reuse. (10)

(ii) Briefly explain about the rain induced attenuation and interference. (10)

Or

(b) (i) With a neat sketch, explain the power budget for a satellite link considering rain fade margin. (10)

(ii) Mention in detail about the ionospheric characteristics considered in link design. (10)

4. (a) (i) Explain the GPS receiver operations and code locking and message recovery procedures. (10)

(ii) Bring out the basic principles used in GPS position and location identification. (10)

Or

(b) (i) Discuss in detail about the GPS receiver operation and differential GPS with necessary block diagram. (15)

(ii) Write short notes on satellite signal acquisition. (5)

5. (a) Write notes on

(i) Intelsat series

(ii) INSAT series

(iii) Mobile satellites services

(iv) INMRSAT

(20)

Or

(b) (i) Describe the operation of a VSAT system with its applications. (10)

(ii) Bring out the significance of satellites in satellite phones, navigation, weather, earth observations. (10)