Code No: **R42043**

R10

Set No. 1

IV B.Tech II Semester Supplementary Examinations, July/Aug - 2015
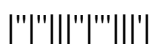## SATELLITE COMMUNICATIONS
(Electronics and Communication Engineering)

Time: 3 hours   **Max. Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
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1. Give comparative study between LEO, MEO, GEO and HEO types of satellites.

2. a) Define the following terms:
    i) Time of perigee   ii) Mean Anomaly
    iii) First point of Aries   iv) Right Ascension
    b) What is an Eclipse? How it affects the satellite function? Explain the way by which the satellite functions normally.

3. a) Explain in detail about tracking subsystem with neat block diagram.
    b) What is Doppler effect? Explain how it is useful for tracking.

4. a) Explain the concept of noise temperature in satellite link design.
    b) Discuss the calculation of system noise temperature.

5. a) What do you mean by multiple accesses in satellite communication?
    b) Calculate the frame efficiency of TDMA frame of period 2.2ms.Total frame length=128000 symbols
       Guard interval = 110 symbols
       No.of Traffic bursts\ frame =14
       No. of Reference burst\frame = 1
       CDC during reference burst = 10 symbols
       No. of Preamble =208symbols

6. a) Explain the small earth station with a neat diagram.
    b) Explain the very small Aperture terminals [VASTS].

7. a) Explain the general aspects of coverage and frequency considerations of low earth orbit.
    b) Why L-band is allocated for mobile satellite service?

8. a) Explain the following in GPS C/A code accuracy:
    i) HDOP   ii) VDOP   iii) GDOP
    b) Explain how the accuracy in GPS measurement is increased.

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1. a) Explain the basic differences between an Active and passive satellites.
   b) Give brief idea about mobile satellite communication.

2. a) Draw and geometry of a geostationary link showing elevation, azimuth and range.
   b) A geostationary satellite moving in an equatorial circular orbit is at a height of 35786Km. from the earth's surface. If the earth radius is taken as 6378Km, determine the theoretical maximum coverage angle and maximum slant range.

3. a) Discuss the orbit control system in brief.
   b) Draw the simplified block diagram of satellite subsystem for 6/4GHz band.

4. a) Discuss the link budget of down link.
   b) Design a Ku band receiving earth station to provide an overall clear air C/N of 17dB in a 27MHz, IF noise bandwidth at carrier frequency of 11.45GHz. The antenna noise temperature is 30K and the LNA noise temperature is 110k. Assume a high gain LNA and ignore the noise generator in the other parts of the receiving antenna. The receiving terminal is located on the 3dB contour of the satellite foot print and clear air attenuation on the path and other losses total 0.8dB.

5. a) Explain the function of the preamble in a TDMA traffic burst.
   b) Write about satellite switched TDMA?

6. a) Explain different tracking techniques used in tracking satellite with a large antennae.
   b) Discuss the design considerations of large antennae.

7. Explain the following in LEO:
   a) Internal growth   b) Interim operations
   c) Replenishment options   d) End-to-End system implementations

8. a) Define the following:
   i) C/A code   ii) Selective availability
   b) Write the GPS services.

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1. List the various frequency bands being used in satellite communication. Compare the advantages and disadvantages of different bands considering the effects of propagation media.

2. a) Discuss the factors which determine the choice of orbit for a communication satellite.
   b) Show that the height of Geo-synchronous orbit is about 36,000Kms.
   c) Find the coverage area of a satellite from which it is visible at a minimum elevation angle of 10^0 for the Geo-synchronous orbit.

3. a) List the various satellite subsystems and state their purpose and principle parameters that characterize them quantatively.
   b) Explain the following:
      i) Telemetry   ii)Tracking and Command

4. a) Explain the design procedure of satellite communication link.
   b) Thermal noise in an earth station receiver results in a $(C/N)d_N$ ratio of 20.0dB. A signal is received from a bent pipe transponder with a carrier to noise ratio $(C/N)_{Up}$ = 20.0dB. What is the value of overall $(C/N)_O$ ratio at the earth station. If the transponder introduces inter-modulation products with (C/I) ratio=24dB. What is the overall $(C/N)_o$ ratio at the receiving earth station.

5. a) Explain structure of traffic data burst in TDMA.
   b) Differentiate the multiplexing and multiple access techniques.

6. a) Explain the operation of dish antenna. How do you reduce aperture blockage?
   b) Describe in detail, why an earth station is located at an altitude?

7. a) What are the basic characteristics features of NGSO?
   b) How the non-geo proposals are categorized?

8. a) What is meant by GPS Navigation message?
   b) Write sub frame details of GPS navigation message?

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1. a) List the various benefits and draw backs of satellite communications.
   b) Explain the various reasons for preferring satellite than optical fibers which are providing very high band width.

2. a) The semi major and semi minor axis of an Elliptical satellite orbit are 20,000Km and 16,000Km respectively. Determine the apigee and perigee distances.
   b) A geosynchronous satellite moving in an equatorial circular orbit at a height of 35000 Km above the surface of the Earth gets inclined at an angle of 2^0 calculate the maximum deviation in latitude and also maximum deviation in longitude. Determine the maximum displacements in Km caused by latitude and longitude displacements.

3. a) Explain difference types of redundancy connections to complete subsystem reliability of a satellite system.
   b) Write short notes on Spacecraft subsystems.

4. a) What are the factors on which a digital communication satellite link depends on? Explain in brief.
   b) Calculate the rain attenuation in the case of a 6/4GHz link if the probability of rain rate for 0.01% of time is 25mm/hr. The earth station is situated at an altitude of 3450ft. Use both SAM and CCIR model for a $=42.1 \times 10^{-6}$ $f^{2.42}$ and b= $1.5f^{-0.08}$

5. a) Explain the back-off in FDMA.
   b) Explain how intermodulation frequencies are generated in FDMA.

6. In earth station explain:
   a) Low-noise amplifier
   b) High power amplifier and mention advantages and disadvantages and applications.

7. a) What factors are used to put interest on NGSO?
   b) What is meant by sun sync orbit? Explain.

8. a) Explain the signal processing techniques used in GPS receiver.
   b) What are the successful measurements in a GPS C/A code receiver?

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