Reg. No. : | | | | | | | | | | | |

Question Paper Code : 30516

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2024.

Fifth/Sixth/Seventh/Eighth Semester

Electronics and Communication Engineering

EC 8094 — SATELLITE COMMUNICATION

(Common to Electronics and Telecommunication Engineering/Geoinformatics Engineering)

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Recall Kepler's third law.

2. Campare and contrast geosynchronous with geostationary satellite.

3. What is the function of Telemetry Tracking and Command (TT and C)?

4. A satellite downlink at 12 GHz operates with a transmitted power of 6W and an antenna gain of 48.2 dB. Calculate the EIRP in dBW.

5. Why is the cassegrain antenna used for large earth station?

6. Infer the Isonoshperic layer characteristics.

7. What is meant by space division multiple access?

8. Recall is the need for burst position synchronization.

9. List the frequency bands assigned for DTH systems.

10. Mention the services of INSAT.

PART B — ($5 \times 13 = 65$ marks)

11. (a) (i) Interpret the equations for look angles determination and the range for geostationary satellite. (8)

(ii) If a satellite is at a height of 36000 km and orbiting in equatorial plane, comment whether the satellite will be under eclipse on equinox days and find the duration of the eclipse. (5)

Or

(b) (i) Summarize the features of satellite launch vehicle. (8)

(ii) A satellite in polar orbit has a perigee height of 600 km and an apogee height of 1200 km. Calculate the mean motion and the rate of regression of the nodes. Assume the polar radius of the earth to be equal to 6357 kms. (5)

12. (a) Explain in detail with necessary schematics the spin stabilization technique and momentum wheel stabilization technique to keep satellites attitude control.

Or

(b) What are the various elements used in the space segments of a satellite system? Explain the need and function of each element in the satellite system.

13. (a) Interpret the tropospheric effects on space link? Also, outline the significance of travelling wave tube amplifier in satellite communication systems.

Or

(b) With a neat block diagram, explain the functional elements of a basic digital earth station and also the main elements of a satellite tracking system.

14. (a) Explain the principle behind spectrum spreading and despreading and how this is used to minimize interference in a CDMA system?

Or

(b) (i) Distinguish between preassigned and demand-assigned traffic in relation to a satellite communications network. (7)

(ii) Describe the ways in which demand assignment may be carried out in an FDMA network. (6)

15. (a) (i) Outline the features of Direct to Home Broadcasting Satellite. (7)

(ii) Write in detail about the features of GPS. (6)

Or

(b) Summarize the characteristics of a typical VSAT system and Key Components for a VSAT network.

PART C — ($1 \times 15 = 15$ marks)

16. (a) A certain 6/4 GHz satellite uplink has earth station EIRP is 100 dBW; Earth station satellite distance is 35780 Km; attenuation due to atmospheric factors is 2 dB; satellite antennas aperture efficiency is 0.8; satellite antennas aperture area is 0.5 m^2; satellite receivers effective noise temperature is 190 K; satellite receivers bandwidth is 20 MHz. Determine the link margin for satisfactory quality of service if the threshold value of received carrier to noise ratio is 30 dB.

Or

(b) Consider a dual up converter with the following specifications: up link frequency spectrum = 14 to 14.5 GHz, First intermediate frequency = 140 MHz, Carrier bandwidth = 72 MHz, BPF 1 Centre frequency = 1.19 GHz. Determine the first local oscillator frequency, range of second local oscillator frequency, frequency spectrum of unwanted sideband bandwidths of BPF 1 and BPF 2.