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

Question Paper Code : 20456

B.E/B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2022.

Fifth/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 × 2 = 20 marks)

1. Mention the advantages and disadvantages of satellite communication system over other types of communication methods.

2. A satellite in an elliptical orbit around the earth has an apogee of 39152 km and a perigee of 500 km. What is the orbital period of this satellite? Give your answer in hours. Assume the average radius of the earth is 6378.137 km and Kepler's constant has the value $3.986004418 \times 10^5 km^3/s^2$.

3. A spacecraft's engine ejects mass at a rate of 30 kg/s with an exhaust velocity of 3,100 m/s. The pressure at the nozzle exit is 5 kPa and the exit area is $0.7m^2$. What is the thrust of the engine in a vacuum?

4. What are the factors need to be considered for the selection of launch vehicles?

5. State the need of earth station antenna.

6. Given: noise temperature of a receiver is 70K and receiver noise figure = 8dB. Calculate the noise temperature at 290K room temperature.

7. Determine the voice channel capacity of a TDMA system with the following characteristics:

(a) Transmission bit rate = 60 Mbps

(b) Voice channel bit rate = 64 kbps

(c) Number of bursts/frame = 10

(d) Number of bits in each preamble = 150

(e) Frame time (microseconds)= 750

8. What do you mean by demand assignment access and state the methods used for the access?

9. Bring out the salient features and applications of INTELSAT series of satellites.

10. Compare and contrast LEO, MEO and GEO satellites.

PART B — (5 × 13 = 65 marks)

11. (a) What do you mean by orbital perturbations? Explain in detail.

Or

(b) An ophthalmology department is planning to perform CATRACT surgery for patients through experts using a satellite link. How Kepler's law of planetary motion support in launching a satellite for such applications? Discuss the conceptual view.

12. (a) What do you mean by satellite attitude? Explain in detail about two attitude.

Or

(b) A GPS Satellite has been launched in the orbit. Discuss in detail about the functions of TTC and monitoring role for this satellite.

13. (a) Explain the impact of rain on link performance. Consider the governing equation for uplink and downlink rain fade margin and elaborate in detail.

Or

(b) How the performance of the system affects due to system noise? Derive the expression for system noise at the receiving earth station.

14. (a) How carrier recovery is obtained in TDMA explain in detail with an example?

Or

(b) State the necessity of Digital Modulation in Satellite links. With the help of block schematics illustrate the principles of the modulation and demodulation of BPSK and QPSK, and compare their spectral characteristics and performance in the performance of noise.

15. (a) Discuss on INMARSAT and VSAT services in detail.

Or

(b) Explain the architecture of GSM in detail.

PART C — ($1 \times 15 = 15$ marks)

16. (a) What are the forces acting on satellite during the powered flight in the atmosphere? Derive the equations of motion for that powered flight stating necessary assumptions.

Or

(b) Explain what the terms centrifugal and centripetal forces mean with regard to a satellite in orbit around the earth and develop the equations for the orbit using Newton's law. A satellite is in a circular orbit around the earth. The altitude of the satellite's orbit above the surface of the earth is 1400 Km.

(i) What are the centripetal and centrifugal accelerations acting on the satellite in its orbit? Give your answer in m/s.

(ii) What is the velocity of the satellite in this orbit? Give your answer in km/s.

(iii) What is the orbital period of the satellite in this orbit? Give your answer in hours, minutes, and seconds. Assume the average radius of the earth is 6378.137 km and Kepler's constant has the value $3.986004418 \times 10^5 \text{ km}^3/\text{s}$.
