SRM VALLIAMMAI ENGINEERING COLLEGE
(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF
ELECTRONICS AND COMMUNICATION ENGINEERING

QUESTION BANK

VIII SEMESTER
1906806 -Satellite Communication
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	UNIT I SATELLITE ORBITS			
	Kepler's Laws, Newton's law, orbital parameters, orbital perturbations, station keeping, geo stationary and non Geo-stationary orbits–Look Angle Determination- Limits of visibility –eclipse-Subsatellite point–Sun transit outage-Launching Procedures-launch vehicles and propulsion.			
	PART A			
Q. No	**Questions**	**CO**	**BT Level**	**Competence**
1.	Mention the services offered by the satellites?	CO1	BTL1	Remembering
2.	Define the Kepler's First law for planetary motion.	CO1	BTL1	Remembering
3.	State Kepler's second law of planetary motion.	CO1	BTL2	Understanding
4.	Write the importance of Kepler's third law.	CO1	BTL2	Understanding
5.	Differentiate ascending node & descending node.	CO1	BTL2	Understanding
6.	List the significance of Newton's law.	CO1	BTL1	Remembering
7.	Differentiate Apogee and Perigee.	CO1	BTL1	Remembering
8.	Identify the frequency bands used for satellite applications.	CO1	BTL1	Remembering
9.	Illustrate the orbital parameters used for positioning a satellite.	CO1	BTL2	Understanding
10.	List the launching stages of satellite with example.	CO1	BTL1	Remembering
11.	Analyze where the determination of antenna look angles used and name it?	CO1	BTL2	Understanding
12.	Mention the purpose of Station keeping.	CO1	BTL1	Remembering
13.	Name the basic factors affecting satellite position.	CO1	BTL1	Remembering
14.	Compute the radius of a circular orbit for which the period is 1-day.	CO1	BTL2	Understanding
15.	Differentiate geostationary and geosynchronous satellite.	CO1	BTL2	Understanding
16.	What are polar orbiting Satellites?	CO1	BTL1	Remembering
17.	Compare prograde orbit and retrograde orbit.	CO1	BTL2	Understanding
18.	Justify why the batteries plays a major role in satellite during eclipse?	CO1	BTL2	Understanding
19.	Analyze the differences between LEO and MEO satellites.	CO1	BTL1	Remembering
20.	What is meant by subsatellite point and its directions?	CO1	BTL1	Remembering
21.	Compare parking orbit and Transfer orbit.	CO1	BTL2	Understanding
22.	Find the viewing angle of a geostationary satellite orbiting at 42000km from an earth station making an elevation angle of 25 degrees.	CO1	BTL2	Understanding
23.	What is meant by sun transit outage?	CO1	BTL1	Remembering
24.	Point out the uses of launching vehicles.	CO1	BTL2	Understanding
	PART – B			
1.	State and Illustrate the Kepler's laws of planetary motion with suitable diagrams. (13)	CO1	BTL3	Applying
2.	(i) Describe the launching procedure of satellite. (8) (ii) Calculate the apogee and perigee heights for the orbital parameters. Assume a mean earth radius of 6371 km. e =.0011501, a=7192.3 km. (5)	CO1	BTL4	Analyzing

3.	(i) State and examine the significance of Newton's laws in satellite communication. (8) (ii) Estimate the suitable equations for azimuth angle and location of geostationary satellite. (5)	CO1	BTL3	Applying
4.	Describe the orbital parameters in detail with necessary illustrations. (13)	CO1	BTL3	Applying
5.	Analyze the effects of non-spherical earth in orbital perturbations. (13)	CO1	BTL4	Analyzing
6.	Summarize the different types of satellite orbits and discuss their merits and demerits. (13)	CO1	BTL3	Applying
7.	A satellite is in a 322 km high circular orbit. Determine: a. The orbital angular velocity in radians per second; (4) b. The orbital period in minutes; and (4) c. The orbital velocity in meters per second. (5) Assume the average radius of the earth is 6378.137 km and Kepler's constant has the value 3.986004418×10^5 $km^3/s^{2.}$	CO1	BTL4	Analyzing
8.	Describe the structures and functions of orbital elements used in satellite. (13)	CO1	BTL3	Applying
9.	Write short notes on (i) Sub satellite point (6) (ii) Propulsion system (7)	CO1	BTL3	Applying
10.	(i) State the significance of station keeping. (7) (ii) Define the term limits of visibility in satellite looking from the earth station. (6)	CO1	BTL3	Applying
11.	Derive the expression for elevation angle for geostationary satellites. (13)	CO1	BTL4	Analyzing
12.	(i)Discuss in detail about the orbital parameters like inclination, ascending node, semimajor axis and eccentricity. (8) (ii)Explain about sun transit outrage. (5)	CO1	BTL4	Analyzing
13.	Summarize the different applications & different services provided by satellite services. (13)	CO1	BTL4	Analyzing
14.	(i) Underline the effects of solar eclipse of satellite. (8) (ii) List the features of near stationary orbits. (5)	CO1	BTL3	Applying
15.	A satellite is orbiting in the equatorial plane with a period from perigee to perigee of 12 h. Given that the eccentricity is 0.002, Investigate the semimajor axis. The earth's equatorial radius is 6378.1414 km. (13)	CO1	BTL4	Analyzing
16.	What is the principle Liquid Propulsion System? Explain the specific technologies under the category of Electric and ion propulsion. (13)	CO1	BTL3	Applying
17.	(i) Asses the orbital velocity of a satellite from the forces acting on the satellite. (5) (ii) Write a brief note on launch vehicles and propulsion. (8)	CO1	BTL4	Analyzing

	Part-C			
1	An earth station situated in the Docklands of London, England, needs to calculate the look angle to a geostationary satellite in the Indian Ocean operated by Intelsat. The details of the earth station site and the satellite are as follows: Earth station latitude and longitude are 52.0°N and 0°, respectively. Satellite longitude (i.e., the subsatellite point) is 66.0° E. (15)	CO1	BTL3	Applying
2	A particular launch from Cape Canaveral released a TDRSS satellite into a circular low orbit, with an orbital height of 270 km. At this point, the TDRSS orbit was inclined to the earth's equator by approximately 28°. The TDRSS satellite needed to be placed into a GTO once released from the launch adaptor, with the apogee of the GTO at geostationary altitude and the perigee at the height of the original circular orbit. (i) What was the eccentricity of the GTO? (5) (ii)What was the period of the GTO? (5) (iii) What was the difference in velocity of the satellite in GTO between when it was at apogee and when it was at perigee? (5) Note: Assume the average radius of the earth is 6378.137 km and Kepler's constant has the value 3.986004418×10^5 km^3/s^2.	CO1	BTL3	Applying
3	A satellite is in an elliptical orbit with a perigee of 1000 km and an apogee of 4000 km. Using a mean earth radius of 6378.14 km, find the period of the orbit in hours, minutes, and seconds, and the eccentricity of the orbit. (15)	CO1	BTL3	Applying
4	(i) Examine the Satellite launch vehicle design and its types. (10) (ii) Determine the limits of visibility for an earth station situated at mean sea level, at a latitude 48.42° north and longitude 89.26° west. Assume a minimum angle of elevation 5°. (5)	CO1	BTL4	Analyzing
5	Examine how launching vehicles locate the satellite into the orbit with necessary diagrams. (15)	CO1	BTL4	Analyzing

	UNIT II SPACE SEGMENT			
	Spacecraft Technology - Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command – Transponders - The Antenna Subsystem			
	PART A			
Q.No	**Questions**	**CO**	**BT Level**	**Competence**
1.	List the materials used for making the satellites.	CO2	BTL1	Remembering
2.	Assess the need of thermal control segment for a spacecraft.	CO2	BTL1	Remembering
3.	Define satellite and its applications.	CO2	BTL1	Remembering
4.	Differentiate split body stabilization with spin stabilization satellite.	CO2	BTL2	Understanding
5.	State the importance of AOCS.	CO2	BTL1	Remembering
6.	Write a note on spin stabilized satellites.	CO2	BTL1	Remembering
7.	Why is altitude control necessary in a satellite?	CO2	BTL2	Understanding
8.	Name the three axes used to define a satellite's attitude.	CO2	BTL1	Remembering
9.	Justify how the attitude of a satellite controlled through active control?	CO2	BTL2	Understanding
10.	Examine why station keeping consumes so much fuel in the satellite.	CO2	BTL2	Understanding
11.	Point out the role of station-keeping maneuvers.	CO2	BTL1	Remembering
12.	Identify the major design types of satellite.	CO2	BTL1	Remembering
13.	Classify the fuel estimation system used in satellite	CO2	BTL2	Understanding
14.	Draw some common structural types to hold the spacecraft.	CO2	BTL2	Understanding
15.	Illustrate how do you achieve stabilization by momentum wheel?	CO2	BTL2	Understanding
16.	Discriminate with advantage of using the solar power than the nuclear power in satellite.	CO2	BTL2	Understanding
17.	State the term propellant and its types.	CO2	BTL1	Remembering
18.	Write the functions of TT&C Subsystem.	CO2	BTL1	Remembering
19.	What is meant by transponder?	CO2	BTL1	Remembering
20.	Examine why noise temperature is a useful concept in communication receiver.	CO2	BTL2	Understanding
21.	Describe the term gain and bandwidth in antenna subsystem.	CO2	BTL1	Remembering
22.	Write the uplink & downlink frequencies of a satellite.	CO2	BTL2	Understanding
23.	Compare momentum wheel and spin stabilization.	CO2	BTL2	Understanding
24.	Express the 3-dB beamwidth of antennas used in satellites.	CO2	BTL2	Understanding
	PART – B			
1.	Describe the communication payload and supporting subsystems used in satellite. (13)	CO2	BTL3	Applying
2.	Illustrate the structure of spacecraft technology and explain the components of spacecraft. (13)	CO2	BTL4	Analyzing
3.	For a satellite circuit the carrier-to-ratio are: uplink 23 dB, downlink 20 dB, intermodulation noise 24dB. Calculate the overall carrier-to-ratio in dB. Suggest a method to reduce intermodulation noise. (13)	CO2	BTL4	Analyzing
4.	Sketch the attitude control momentum wheel stabilization in the	CO2	BTL4	Analyzing

	space segment with necessary diagrams and explain it. (13)			
5.	Describe the term antenna and discuss in detail about the various antenna used in the satellite. (13)	CO2	BTL3	Applying
6.	Assess the various methods of generating the power in satellites and explain the importance of solar cells in satellite. (13)	CO2	BTL4	Analyzing
7.	Summarize the importance of propulsion system. Also explain about mono and bi-propellant system used in satellite. (13)	CO2	BTL3	Applying
8.	Examine how the altitude and orbit control system is achieved through spin stabilization systems? Give necessary diagrams. (13)	CO2	BTL4	Analyzing
9.	Illustrate the functions of Telemetry, Tracking and Command system in ground segment with suitable diagrams. (13)	CO2	BTL3	Applying
10.	Describe the components of thermal control system and why it is necessary in a satellite. (13)	CO2	BTL4	Analyzing
11.	Explain what is meant by satellite altitude and briefly describe two forms of attitude control. (13)	CO2	BTL3	Applying
12.	Describe the East West and North South station keeping maneuvers required in satellite station keeping. (13)	CO2	BTL3	Applying
13.	(i) Describe the necessity of power amplifier in the transponder. (8) (ii) List out the methods of estimating the fuel in the satellite.(5)	CO2	BTL3	Applying
14.	Describe briefly about the antenna subsystem and Derive the antenna gain and bandwidth of antenna subsystem. (13)	CO2	BTL3	Applying
15.	Analyze the reasons behind why the transponders are connected in the communication channel with neat diagrams. (13)	CO2	BTL4	Analyzing
16.	Briefly describe the three-axis method of satellite stabilization. (13)	CO2	BTL3	Applying
17.	Elaborate the wideband receiver used in satellite transponder. (13)	CO2	BTL4	Analyzing
	PART-C			
1.	A large GEO satellite requires a total of 12 kW to operate its communication systems and 1.5 kW for housekeeping purposes. The solar cells on the satellite are mounted on two large sails that rotate to face the sun at all times. The efficiency of the solar cells is 36% at BOL and 33% at EOL. Using an average incident solar flux density of 1.36 kW/m2 (i) Calculate the area of each solar sail to meet the power requirements at the end of the Satellite's life. (5) (ii) Estimate the power generated at BOL? The solar arrays are 2.0m wide. (5) (iii) What is the length? (5)	CO2	BTL3	Applying
2.	Examine the various elements used in the space segments of a satellite system? Explain the need and function of each element in the satellite system. (15)	CO2	BTL4	Analyzing

3.	(i) Calculate the total power radiated by the sun in watts and in dBW. Hint: The sun is 93million miles (about 150 million kilometers) from the earth. At that distance, the sun produces a flux density of 1.36 kW/m^2. This power density is present over all of a sphere with a radius of 150 million km. (8) (ii) The earth subtends an angle of 17° when viewed from geostationary orbit. What are the dimensions and gain of a horn antenna that will provide global coverage at 4 GHz? (7)	CO2	BTL3	Applying
4.	Analyze the stages involved and functions of the telemetry, tracking and command system between the satellite and ground station. (15)	CO2	BTL4	Analyzing
5.	Describe the TWTA power amplifier used in a satellite transponder and its power output. (15)	CO2	BTL4	Analyzing

	UNIT III SATELLITE LINK DESIGN			
	Basic link analysis, Interference analysis, Rain induced attenuation and interference, Ionospheric characteristics, Link Design with and without frequency reuse.			
	PART A			
Q.No	**Questions**	**CO**	**BT Level**	**Competence**
1.	Write the importance of RF power density.	CO3	BTL2	Understanding
2.	Outline the path loss in satellite communication.	CO3	BTL2	Understanding
3.	Define noise factor.	CO3	BTL1	Remembering
4.	Interpret the term saturation flux density.	CO3	BTL2	Understanding
5.	What is EIRP of an antenna?	CO3	BTL1	Remembering
6.	A satellite downlink at 12GHz operates with a transmit power of 6w and an antenna gain of 48.2dB. Calculate the EIRP in dBW.	CO3	BTL2	Understanding
7.	The range between a ground station and a satellite is 42000 km. Calculate the free space loss a frequency of 6 GHz.	CO3	BTL2	Understanding
8.	What is a single carrier per channel SCPC)?	CO3	BTL1	Remembering
9.	Write the equation of link budget.	CO3	BTL1	Remembering
10.	What are factors contributing to noise in an earth station receiving channel?	CO3	BTL2	Understanding
11.	List the earth station parameters affecting C/N ratio?	CO3	BTL1	Remembering
12.	A receiving system has antenna noise temperature of 60K & its receiver noise figure 9dB. Find the system noise temperature if room temperature is 290K.	CO3	BTL2	Understanding
13.	How would you relate Input and output back-off for the satellite traveling-wave-tube amplifier?	CO3	BTL2	Understanding
14.	The range between a ground station and a satellite is 42,000 Km. Predict the free space loss at a frequency of 10 GHz.	CO3	BTL2	Understanding
15.	Illustrate the antenna misalignment losses.	CO3	BTL2	Understanding

16.	Why is the cassegrain antenna popular for large earth station?	CO3	BTL2	Understanding
17.	Point out the basic requirements of an earth station antenna.	CO3	BTL1	Remembering
18.	Outline the concept of fade margin.	CO3	BTL1	Remembering
19.	Define intermodulation noise.	CO3	BTL1	Remembering
20.	Identify the effects of rain in fade margin.	CO3	BTL1	Remembering
21.	Define false detection probability.	CO3	BTL1	Remembering
22.	Name the ionospheric effects on space link.	CO3	BTL1	Remembering
23.	What is the relationship between EIRP and antenna gain?	CO3	BTL1	Remembering
24.	What is meant by polarization interleaving?	CO3	BTL1	Remembering
	PART – B			
1.	(i) Derive the expression for Equivalent Isotropic Radiated Power. (10) (ii) Find the gain in decibels of a 3-m paraboloidal antenna operating at a frequency of 12 GHz. Assume an aperture efficiency of 0.55. (3)	CO3	BTL3	Applying
2.	(i) Express the uplink equation with respect to saturation flux density. (8) (ii) An uplink operates at 14 GHz, and the flux density required to saturate the transponder is -120 dB (W/m^2). The free-space loss is 207 dB, and the other propagation losses amount to 2 dB. Calculate the earth-station [EIRP] required for saturation, assuming clear-sky conditions. (5)	CO3	BTL3	Applying
3.	Summarize the various types of system noise and explain in detail. (13)	CO3	BTL3	Applying
4.	A satellite link operating at 14 GHz has receiver feeder losses of 1.5 dB and a free-space loss of 207 dB. The atmospheric absorption loss is 0.5 dB, and the antenna pointing loss is 0.5 dB. Depolarization losses may be neglected. Determine the total link loss for clear-sky conditions. (13)	CO3	BTL3	Applying
5.	Demonstrate the equation of noise figure and carrier to noise ratio with necessary diagrams. (13)	CO3	BTL3	Applying
6.	Explain about free space transmission losses and express the received power in unit of dBW. (13)	CO3	BTL3	Applying
7.	Describe the noise temperature of absorptive networks and Derive the expression for overall system noise temperature at the receiving earth station. (13)	CO3	BTL4	Analyzing
8.	Discuss the following in detail: (i) Uplink rain-fade margin (7) (ii) Downlink rain-fade margin (6)	CO3	BTL4	Analyzing
9.	Analyze input and output back-off relationship for the satellite traveling-wave-tube amplifier. (13)	CO3	BTL4	Analyzing
10.	Draw the power flow diagram and explain combined uplink and downlink communication. (13)	CO3	BTL3	Applying

11.	A QPSK signal is transmitted by satellite. Raised-cosine filtering is used, for which the rolloff factor is 0.2 and a bit error rate (BER) of 10^{-5} is required. For the satellite downlink, the losses amount to 200 dB, the receiving earth-station G/T ratio is 32 dBK, and the transponder bandwidth is 36 MHz. Calculate the bit rate which can be accommodated and the EIRP required. (13)	CO3	BTL4	Analyzing
12.	Describe the following with diagram. (i) Feeder losses (7) (ii) Antenna misalignment losses (6)	CO3	BTL3	Applying
13.	Examine the effects of ionosphere in satellite communication. (13)	CO3	BTL4	Analyzing
14.	Write a detail note on the link design with and without frequency reuse. (13)	CO3	BTL3	Applying
15.	Explain with neat diagram, the community antenna TV system. (13)	CO3	BTL3	Applying
16.	(i) An antenna has a noise temperature of 35 K and is matched into a receiver which has a noise temperature of 100 K. Calculate the noise power for a band of 36MHz. (5) (ii) What is input backoff? Also substantiate the reason behind employing it. (8)	CO3	BTL4	Analyzing
17.	(i) How does the system noise temperature affect the performance of satellite communication? (5) (ii) A LNA is connected to a receiver which has a noise figure of 12 dB. The gain LNA is 30dB and its noise temperature is 12k. Calculate the overall noise temperature referred to the LNA input. (8)	CO3	BTL4	Analyzing
	PART C			
1.	(i) In a link budget calculation at 12GHz the free space loss is 20dB, the antenna pointing loss is 1dB and atmospheric absorption is 2dB. The receiver [G/T] is 19.5dB/K and the receiver feeder loss is 1dB. The EIRP is 48dBw. Calculate the carrier to noise power spectral density ratio. (5) (ii) Elaborate the types of transmission losses with necessary diagrams. (10)	CO3	BTL3	Applying
2.	Explain the design of uplink in satellite communication with necessary expressions. (15)	CO3	BTL3	Applying
3.	(i)How would you calculate EIRP in satellite downlink? (10) (ii) A satellite is operated at an EIRP of 56 dBW with an output BO of 6 dB. The transmitter feeder losses amount to 2 dB, and the antenna gain is 50 dB. Calculate the power output of the TWTA required for full saturated EIRP. (5)	CO3	BTL4	Analyzing
4.	Analyze a systemic approach to compensate the rain fade in satellite communication. (15)	CO3	BTL4	Analyzing
5.	(i)Examine how the link-power budget equation determines	CO3	BTL4	Analyzing

	the received power under clear sky condition. (8) (ii)A satellite link operating at 14 GHz has receiver feeder losses of 1.5 dB and a free space loss of 207 dB. The atmospheric absorption loss is 0.5 dB and the antenna pointing loss is 0.5 dB. Calculate the total link loss for clear sky conditions. (7)			

	UNIT IV SATELLITE ACCESS			
	Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system, Digital video Broadcast, multiple access: FDMA, TDMA, CDMA, Assignment Methods, Coding Schemes.			
	PART A			
Q. No	**Questions**	**CO**	**BT Level**	**Competence**
1.	Compare multiple access with single access technique.	CO4	BTL2	Understanding
2.	Define multiplexing.	CO4	BTL1	Remembering
3.	Relate the spread spectrum system with conventional communication system?	CO4	BTL2	Understanding
4.	Interpret the CDMA receiver function for the purpose of synchronization maintenance and reliable data reconstruction?	CO4	BTL2	Understanding
5.	Write the two basic problem in satellite digital transmission	CO4	BTL2	Understanding
6.	What is the need of reference burst in TDMA?	CO4	BTL1	Remembering
7.	Compare SPEC and DSI method.	CO4	BTL2	Understanding
8.	What is preamble and post amble in TDMA frame?	CO4	BTL2	Understanding
9.	List the advantages of TDMA over FDMA.	CO4	BTL1	Remembering
10.	Outline the limitations of CDMA.	CO4	BTL2	Understanding
11.	Write the two basic problems in satellite digital transmission.	CO4	BTL2	Understanding
12.	List the several advantages of VSAT type CDMA offers of satellite networking.	CO4	BTL1	Remembering
13.	What is meant by Space Division Multiple Access?	CO4	BTL1	Remembering
14.	List the features of spread spectrum communication.	CO4	BTL2	Understanding
15.	Examine the guard time of TDMA.	CO4	BTL2	Understanding
16.	Mention the error detection coding schemes.	CO4	BTL1	Remembering
17.	Find the frame efficiency of TDMA.	CO4	BTL2	Understanding
18.	Define the processing gain of a satellite access.	CO4	BTL1	Remembering
19.	List the significance of digital speech interpolation.	CO4	BTL1	Remembering
20.	Define SCPC system.	CO4	BTL1	Remembering
21.	Write the limitations of FDMA-satellite access?	CO4	BTL2	Understanding
22.	Differentiate pre-assigned and demand assigned traffic.	CO4	BTL2	Understanding
23.	Distinguish centrally controlled random access for satellite access from distributed controlled random access.	CO4	BTL2	Understanding
24.	What is the need for burst position synchronization?	CO4	BTL2	Understanding
	PART – B			

1.	With suitable figures, explain the SPADE communication system and how this is used on Intelsat satellites. (13)	CO4	BTL4	Analyzing
2.	Write the design aspects and explain the technical features of TDMA frame structure. (13)	CO4	BTL3	Applying
3.	(i) Outline the operation of FDMA and list how this differs from FDM. (6) (ii)What are the ways in which demand assignment may be carried out in FDMA network? (7)	CO4	BTL3	Applying
4.	Compare uplink power requirements for FDMA and TDMA with necessary diagrams. (13)	CO4	BTL4	Analyzing
5.	Analyze the concept of direct sequence spread spectrum communication with necessary diagrams. (13)	CO4	BTL4	Analyzing
6.	Describe about digital video broadcasting with real time example. (13)	CO4	BTL3	Applying
7.	Evaluate the techniques of compression and encryption used in satellite communication with general block diagram. (13)	CO4	BTL4	Analyzing
8.	(i) What are the digital transmission systems used in satellites. (3) (ii) Analyze the concept of ADM & ADPCM techniques. (10)	CO4	BTL4	Analyzing
9.	Discuss the following with neat diagram. (i) Analog voice transmission systems, (6) (ii) PCM coder/decoder (CODEC). (7)	CO4	BTL2	Understanding
10.	Illustrate in detail about pre assigned & demand assigned FDMA with necessary diagrams. (13)	CO4	BTL4	Analyzing
11.	Explain the principle behind the spectrum spreading and despreading and how this is used to minimize interference in a CDMA system. (13)	CO4	BTL3	Applying
12.	Discriminate the operation of On-Board signal processing for FDMA/TDMA operation with suitable diagrams. (13)	CO4	BTL4	Analyzing
13.	Illustrate the satellite switched TDMA with switch matrix. (13)	CO4	BTL4	Analyzing
14.	Summarize the following, (i) Digital TASI in TDMA operation, (6) (ii) Speech predictive encoded communications. (7)	CO4	BTL 4	Analyzing
15.	Illustrate the schematic block of voice & data MUX/DEMUX. (13)	CO4	BTL4	Analyzing
16.	Explain in detail about coding techniques used in satellite communication. (13)	CO4	BTL3	Applying

17.	In a TDMA network the reference burst and the preamble each requires 560 bits, and the nominal guard interval between bursts is equivalent to 120 bits. Given that there are eight traffic bursts and one reference burst per frame and the total frame length is equivalent to 40, 800 bits, calculate the frame efficiency. (13)	CO4	BTL3	Applying
	PART C			
1.	A 14-GHz uplink operates with transmission losses and margins totaling 212 dB and a satellite [G/T] = 10 dB/K. The required uplink [Eb/N0] is 12dB. (a) Assuming FDMA operation and an earth-station uplink antenna gain of 46 dB, calculate the earth-station transmitter power needed for transmission of a T1 baseband signal. (b) If the downlink transmission rate is fixed at 74 dBb/s, calculate the uplink power increase required for TDMA operation. (15)	CO4	BTL3	Applying
2.	(i) A TDMA circuit that uses QPSK modulation has a downlink [C/N0] of 87.3 dBHz. Calculate the maximum transmission rate and the IF bandwidth required assuming a roll-off factor of 0.2, when A BER of 10^{-5} is required. (5) (ii) Examine the characteristics of Code division multiple access technique and lists its advantages. (10)	CO4	BTL4	Analyzing
3.	The code waveform in a CDMA system spreads the carriers over the full 36 MHz bandwidth of the channel, and the roll off factor for the filtering is 0.4. The information bit rate is 64 kb/s, and the system uses BPSK. Calculate the processing gain in decibels. Given that the BER must not exceed 10^{-5}, give an estimate of the maximum number of channels that can access the system and throughput. (15)	CO4	BTL4	Analyzing
4.	(i) Draw the encoder diagram for the following digital signals- Unipolar NRZ, Polar NRZ, Manchester, Polar RZ for the digital data 1010111. (10) (ii) TDMA is a truly digital technology, requiring that all information be converted into bit streams or data packets before transmission to the satellite-Justify. (5)	CO4	BTL4	Analyzing
5.	Describe the features of the various multiple access schemes deployed for satellite access. Compare the salient features of FDMA, TDMA and CDMA. (15)	CO4	BTL3	Applying

UNIT V SATELLITE APPLICATIONS

INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. GPS Position Location Principles, Differential GPS, Direct Broadcast satellites (DBS/DTH).

PART A

Q. No	Questions	CO	BT Level	Competence
1.	What are the regions covered by INTELSAT satellite?	CO5	BTL 2	Understanding
2.	Write the features of INTELSAT I satellite.	CO5	BTL 2	Understanding
3.	Point out the services provided by INTELSAT satellites.	CO5	BTL 1	Remembering
4.	List out the names of any four mobile satellite services.	CO5	BTL 2	Understanding
5.	Mention the services of INSAT.	CO5	BTL 2	Understanding
6.	Categorize the three regions to allocate the frequency for satellite services.	CO5	BTL 1	Remembering
7.	Summarize the features of GSM.	CO5	BTL 2	Understanding
8.	Define the term ORBCOMM in satellite services.	CO5	BTL 1	Remembering
9.	Interpret the working of satellite navigational system.	CO5	BTL 1	Remembering
10.	Infer the payload of INSAT-3C.	CO5	BTL 2	Understanding
11.	Name the services provided by GSM.	CO5	BTL 1	Remembering
12.	What is GRAMSAT?	CO5	BTL 1	Remembering
13.	Mention the services provided by INMARSATs and the regions covered by it.	CO5	BTL 1	Remembering
14.	What is the dilution of precision in GPS?	CO5	BTL 2	Understanding
15.	Write the basic principle of VSAT networks.	CO5	BTL 1	Remembering
16.	Categorize the functional elements of Network Switching Subsystem.	CO5	BTL 2	Understanding
17.	Point out the applications of GPS.	CO5	BTL 1	Remembering
18.	How does a satellite transfer TV signals to the particular consumer?	CO5	BTL 2	Understanding
19.	Distinguish between DBS and DTH service.	CO5	BTL 2	Understanding
20.	Write the difference between active and passive satellites?	CO5	BTL 2	Understanding
21.	Outline the concept of DBS TV/FM reception.	CO5	BTL 1	Remembering
22.	Write the principle behind DTH and GPS.	CO5	BTL 1	Remembering
23.	List the components used in DBS system.	CO5	BTL 1	Remembering
24.	Name the functional units of GSM network.	CO5	BTL 1	Remembering

PART – B

1.	Explain any three INTELSAT satellites with respect to transponders, power and lifetime. (13)	CO5	BTL 4	Analyzing
2.	Analyze the following INSAT satellites. (i) INSAT-3A, (5) (ii) INSAT-3C, (4) (iii)INSAT-4B. (4)	CO5	BTL 4	Analyzing
3.	Explain the characteristics of a typical VSAT system and Key Components for a VSAT network. (13)	CO5	BTL 3	Applying
4.	Examine the functional units of GSM network and explain	CO5	BTL 3	Applying

	each in detail. (13)			
5.	Write short notes on the specialized services offered by satellites for video conferencing e- mail and internet. (13)	CO5	BTL 4	Analyzing
6.	Illustrate the following with example: (i) Low Earth Orbits. (7) (ii) Medium Earth Orbits. (6)	CO5	BTL 3	Applying
7.	How mobile services are used in satellite communication systems? (13)	CO5	BTL 3	Applying
8.	Discuss in detail about: (i) INMARSAT 3 (I-3) (4) (ii) INMARSAT 4 (I-4) (4) (iii) INMARSAT 5 (I-5) (5)	CO5	BTL 3	Applying
9.	Explain the Indian Navigation systems with its applications. (13)	CO5	BTL 3	Applying
10.	Analyze the following, (i) Working of DBS system, (7) (ii) GSM. (6)	CO5	BTL 4	Analyzing
11.	Elaborate the main features and services offered by mobile satellite systems. (13)	CO5	BTL 4	Analyzing
12.	(i) Illustrate about GAGAN and IRNSS. (8) (ii) Examine the functions of ORBCOMM. (5)	CO5	BTL 4	Analyzing
13.	Generalize the ECEF coordinate system, location determination and working of GPS. (13)	CO5	BTL 4	Analyzing
14.	(i)Interpret the concept behind DTH. (8) (ii) Distinguish the DBS and DTH. (5)	CO5	BTL 4	Analyzing
15.	(i)Illustrate the working principle of DBS-TV receiving system. (8) (ii) Write an overview on VSAT systems. (5)	CO5	BTL 3	Applying
16.	Develop the working of a DBS system and its frequency bands. (13)	CO5	BTL 3	Applying
17.	With necessary sketches, explain the operation of INMARSAT. (13)	CO5	BTL 4	Analyzing
	PART – C			
1.	Explain the basic techniques and network configurations of VSAT. State briefly where VSAT system find widest application. (15)	CO5	BTL 3	Applying
2.	Analyze the features, Architecture and applications of GSM with necessary diagrams. (15)	CO5	BTL 4	Analyzing
3.	Summarize the features of digital TV broadcast and explain the various factors of home receiver unit. (15)	CO5	BTL3	Applying

4.	(i)Identify the working and position of satellites of GNSS. (5) (ii) Examine the satellite navigation system developed by ISRO. (10)	CO5	BTL4	Analyzing
5.	Explain why a minimum of four satellites must be visible at an earth location utilizing the GPS system for position determination. What does the term dilution of position refer to? (15)	CO5	BTL 3	Applying