Name: **Enrolment No:**	

UPES

End Semester Examination, May 2024

Course: Satellite Communication **Semester: VIII**

Program: B.Tech (Aerospace Engineering (Avionics)) **Time : 03 hrs.**

Course Code: ECEG4025P **Max. Marks: 100**

Instructions: Answer all the sections

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q1	Interpret the orbital parameters	**4**	**CO1**
Q2	A geostationary satellite is orbiting around the earth in elliptical orbit. The ratio of OB to OA is R (O being the earth, A and B are two points in the orbit for the satellite). Enumerate the ratio of speed of the satellite at A and B.	**4**	**CO1**
Q3	Explain the process of placement of geostationary satellites into desired orbit	**4**	**CO1**
Q4	Elucidate the budget equation used to calculate received signal power by accounting for all the gains and losses in the communication link	**4**	**CO3**
Q5	Demonstrate the two-way ground station that transmits and receives data from satellites	**4**	**CO4**
	SECTION B **(4Qx10M= 40 Marks)**		
Q6	Investigate the system utilized to control the orientation of the axis of satellites that are orbiting in space OR (b) Investigate the device that amplifies the power of frequency down converted signal (down link) to the required level in the transponder	**10**	**CO2**
Q7	Analyze the antenna subsystems utilized in satellites for the process of transmission (uplink and downlink)	**10**	**CO2**
Q8	Examine the noise available in the space segment comprised of the satellites	**10**	**CO3**
Q9	Illustrate the following mobile satellite services: (a) maritime satellites based with the provision of voice and high-speed data services for maritime and land based users (b) Satellites on Geosynchronous earth orbits and low earth orbits	**10**	**CO4**

SECTION-C (2Qx20M=40 Marks)			
Q10	(a) Consider an antenna is utilized as a component in an earth station and geostationary satellite is orbiting the earth. Calculate the azimuth and elevation angle of the earth station antenna. Assume the values of Latitude of earth station antenna and the difference between position of satellite orbit and earth station antenna. OR (b) A geostationary satellite orbits around the earth in a circular orbit of radius 36000 km. Compute the approximate time period of a spy satellite orbiting a few hundred km above earth's surface (Radius of earth = 6400 km). (c) A satellite is orbiting in the equatorial plane with a period from perigee to perigee of 12 hours. Enumerate the semimajor axis. Assume the eccentricity = 0.05 and earth's equatorial radius = 6378 km.	**20**	**CO1**
Q11	(a) For an uplink the required [C/N] ratio is 20 dB. The operating frequency is 30 GHz, and the bandwidth is 72 MHz. The satellite [G/T] is 14.5 dBK^{-1}. Assuming operation with 11 dB input BO, calculate the saturation flux density. [RFL] are 1 dB (b) The following parameters apply to a satellite downlink: saturation [EIRP] 22.5 dBW, free-space loss 195 dB, other losses and margins 1.5 dB, earth station [G/T] 37.5 dB/K. Calculate the [C/N0] at the earth station. Assuming an output BO of 6 dB is applied, what is the new value of [C/N0]?	**20**	**CO3**