

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(MID SEMESTER EXAMINATION)**

CLASS: B.TECH  
BRANCH: ECE

SEMESTER: VII  
SESSION: MO/2022

**SUBJECT: EC419 SATELLITE COMMUNICATION**

TIME: 2 HOURS

FULL MARKS: 25

**INSTRUCTIONS:**

1. The total marks of the questions are 25.
2. Candidates attempt for all 25 marks.
3. Before attempting the question paper, be sure that you have got the correct question paper.
4. The missing data, if any, may be assumed suitably.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q1	(a) What is the difference between a geosynchronous satellite and geosynchronous satellite orbit?	[2]	I	I
Q1	(b) Give the mathematical formulation of Kepler's 1st law of planetary motion?	[3]	II	II
Q2	(a) What do you mean by orbital perturbations?	[2]	I	I
Q2	(b) An earth station situated in the UK. 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 50.0 degree N and 0 degree. Satellite longitude (sub satellite point) is 60 degree E. Is (Satellite) it visible from Earth station?	[3]	II	III
Q3	(a) Thermal noise in an earth station receiver results in a $(C/N)_{dn}$ ratio of 25 .0dB. A signal is received from a bent pipe transponder with a carrier to noise ratio $(C/N)_{up} = 25\text{dB}$ . What is the value of $(C/N)_o$ at the earth station.? If the transponder introduces inter modulation products with $(C/I)$ ratio 30dB, What is the over all $(C/N)_o$ at the receiving earth station?	[2]	III	III
Q3	(b) How the Range varies between satellite and user terminal if the position of a satellite with respect to the earth exhibits a cyclic daily variation.	[3]	II	II
Q4	(a) A C band earth station has an antenna with a transmit gain of 54 dB. The transmitter output power is set to 100 W at a frequency of 6.100 GHz. The signal is received by a satellite at a distance of 37,500 km by an antenna with a gain of 26 dB. The signal is then routed to a transponder with a noise temperature of 500 K, a bandwidth of 36 MHz, and a gain of 110 dB. i) Calculate the path loss at 6.1 GHz ii) Calculate the power at the output port of the satellite antenna, in dBW iii) Calculate the noise power at the transponder input, in dBW, in a bandwidth of 36 MHz	[2]	III	III
Q4	(b) Derive the expression for link equation used for calculation of power received in any radio link.	[3]	III	IV
Q5	(a) What is the difference between Spin stabilized satellite (Spinners) and three axis stabilized satellites.?	[2]	III	II
Q5	(b) With the help of suitable diagram, mention the techniques used for tracking satellites by earth station.	[3]	IV	IV

::: 28/09/2022 :::M