

<b>Name:</b> <b>Enrolment No:</b>	
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**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**  
**End Semester Examination, May 2022**

**Course: Satellite Communication**  
**Programme: B. Tech ECE**  
**Course Code: ECEG 4025P.**

**Semester: VIII**  
**Time: 03 hrs.**  
**Max. Marks: 100**

**Instructions:      Attempt all question**  
**Diagrams must be neat and clean**

Geo centric constant =  $4 \times 10^{14} \text{ m}^3/\text{s}^2$ .  
Mass of Earth =  $5.9 \times 10^{24} \text{ kg}$   
Diameter of Earth at equator = 12800 km.  
Boltzmann Constant =  $1.4 \times 10^{-26} \text{ J/s}$   
Mass of Moon =  $7.3 \times 10^{22} \text{ kg}$   
Radius of Moon = 1750 km  
Universal Gravitational constant =  $6.67 \times 10^{-11} \text{ m}^3/\text{kg}\cdot\text{s}^2$   
Speed of EM wave =  $3 \times 10^8 \text{ m/s}$ .

**SECTION A**  
**(5Qx4M=20Marks)**

S. No.		Marks	CO
Q 1	Specified the characteristics of the satellite orbit means for IRS, INSAT and GPS satellites.	4	CO1
Q 2	Why the downlink frequency is less than the uplink frequency in telecommunication using satellite?	4	CO2
Q 3	In which direction dish antenna of DTH TV system is tilted in Sydney. Justify the answer.	4	CO3
Q 4	Why Moon can not be used as a communication or earth observation satellite?	4	CO4
Q 5	Write down Kepler's three laws of motion that governs the movement of a satellite around the Earth.	4	CO2

**SECTION B**  
**(4Qx10M= 40 Marks)**

Q 6	Describe the various stages in the placement of a satellite from the launching site to the desired operational orbit. Why Sriharikota is considered to be the best choice for launching station?	10	CO1
Q 7	Briefly describe the operation of a transponder system operating at Ku band.	10	CO2

	Illustrate the transponder link with the help of suitable diagram.		
Q 8	How a telephone signal is received at the downlink earth station terminal from a satellite. Illustrate with necessary diagram.	10	CO3
Q 9	What is SPADE? Describe the working of accessing the links by different earth station from a transponder using Time Division Multiple Access.	10	CO4
<b>SECTION-C</b> <b>(2Qx20M=40 Marks)</b>			
Q 10	<p>The downlink specification of a communication satellite is given as:</p> <p style="text-align: center;"> Satellite transmitted power = 400 dBm  Gain of the satellite antenna = 120 dBm  Gain of the earth station antenna = 20 dB  Transponder bandwidth = 400 MHz  Downlink frequency = 4GHz  Noise Figure = 2  Room Temperature = 27°C  Feeder loss = 2 dB  Antenna alignment loss = 1.5 dB  Distance of satellite from earth station = 40500 km </p> <p>Compute (i) EIRP (ii) Noise Power (iii) Space loss (iv) Downlink Carrier to Noise ratio.</p>	20	CO4
Q 11	<p>(a) A satellite is in geo stationary orbit and revolving round the earth in 24 hrs. If the height of the satellite is reduced in such a way that it covers 3 revolution around in the earth in 24 hrs, then compute</p> <p>(i) The height of satellite.  (ii) The speed of the satellite in new orbit.</p> <p>(b) Chandrayan in its final stage of descending over the moon was revolving in an elliptical orbit, where its apogee and perigee points are 500 km and 100 km respectively. The orbital path was such that the Moon was at one of its focus. In the last maneuver, the elliptical path is transferred to a circular orbit, so that the satellite is at equal distance from the Moon. Determine the time required by the Chandrayan to revolve around the moon in its new circular orbit.</p>	10+10	CO3