

Name:

Enrolment No:



## UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2020

Programme Name: B.Tech ASE+AVE

Course Name : Satellite Communication

Course Code : ECEG 4025

Nos. of page(s) : 02

Semester : V

Time : 03 hrs

Max. Marks : 100

Instructions:

### SECTION A

[5x6=30]

Type the Answers/Short Notes

| S. No. |   | Marks | CO   |
|--------|---|-------|------|
| Q 1    | Describe the microwave frequencies for the waves to travel in space for the satellite technology                                      | 5     | CO1  |
| Q 2    | How uplink and downlink antennas are used for the reception, modulation and retransmission of the waves received from earth stations. | 5     | CO2  |
| Q 3    | How atmospheric affects the structure of body while reentering into the Earth's atmosphere?   | 5     | CO 3 |
| Q 4    | Describe ionosphere, tropospheric and space based propagation for the wave transmission and reception                                 | 5     | CO 4 |
| Q 5    | What is parking orbit and interplanetary flights?   | 5     | CO1  |
| Q 6    | Differentiate between power gain and voltage gain.  | 5     | CO4  |

### SECTION B

[10x5=50]

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|      |  |    |      |
|------|--|----|------|
| Q 7  | Discuss all three Kepler's laws used in the orbital mechanics and how it has been evolved for the trajectory design problems?  | 10 | CO2  |
| Q 8  | Prove all the laws using the Newton's law of gravitation. Discuss the argument of Perigee and Apogee. For what inclination of the orbit it is called retrograde orbit and why?   | 10 | CO 1 |
| Q 9  | An elliptical orbit with perigee of 1500 km and apogee of 36825km. Determine the period of eccentricity of the satellite. Discuss the concept of apogee and perigee in case of satellite technology and orbit design problems. | 10 | CO 3 |
| Q 10 | Define the term "power density" used in the radio wave propagation. How the transmission and receptions are affected once the wave propagates in space? Derive   | 10 | CO 4 |

|                                      |   |           |             |
|--------------------------------------|---|-----------|-------------|
|                                      | the relationship for the received power at the receiver section. The derivation should also be in terms of dBs.   |           |             |
| Q 11                                 | If the power transmitted from the transmitter is 10kW and gains of transmitting and receiving antennas are 30dB and 30dB respectively then calculate the maximum power received at a distance of 10km over free space for 3GHz transmission frequency.  | <b>10</b> | <b>CO 4</b> |
| <b>SECTION-C</b><br><b>[1x20=20]</b> |   |           |             |
| <b>Scan and Upload</b>               |   |           |             |
| Q 12                                 | <p>A) What do you understand by mass ratio and mass fraction? What is Hohmann orbit? Explain its basic features.</p> <p>B) A space shuttle with its fuel has weight of 1700250kg at lift off and has a dry weight of 330000 kg. Find the mass fraction of the space shuttle. During the launch, and exhaust velocity of a rocket is 5.5km/s and the increment velocity is achieved as 8.7km/s. Calculate the mass fraction.</p> | <b>20</b> | <b>CO2</b>  |