UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2019

Course: Satellite Communication   **Semester: VII**
Program: B. Tech (EE & BCT)   **Time: 03 hrs.**
Course Code: ELEG 307   **Max. Marks: 100**

Instructions: **Attempt all question**
                        Diagrams must be neat and clean
                        Radius of earth at equator = 6400×10^3 m.
                        Gravitational constant = 6.67×10^{-11} m^3 kg^{-1} s^{-2}
                        Velocity of EM wave = 3×10^8 m s^{-1}

SECTION A

S. No.		Marks	CO
Q 1	Briefly describe the **process** (with suitable block diagram) of the transmission of a **baseband signal from earth station** to **satellite** in space.	5	CO1
Q 2	Comment on the **suitable choice** of **digital modulation** technique employed in satellite communication.	5	CO3
Q 3	Calculate the time period of a satellite in **geo stationary orbit**.	5	CO4
Q 4	The earth station/ DTH **antenna** is titled toward which **direction** in Sydney and why?	5	CO2

SECTION B

Q 5	Write the formula of **Kepler laws of motion** with respect to a geo stationary satellite along with the trajectory of the satellite. From the suitable formula, calculate the **total time** taken by **Orbiter** section of Chandrayaan –II to complete one revolution of the Moon. The height of the orbiter is 100 km and the orbit is circular. Mass of Moon is 7.35×10^{22} kg and Radius of Moon = 1700 km	10	CO3

Q 6	Describe the various stages in the **placement** of a IRS satellite from the **launching site** to the desired **geo stationary orbit**. State with valid reason the choice of launch site and launch vehicle.	**10**	**CO1**
Q 7	Briefly describe the operation of a **single stage transponder system**. Illustrate the transponder link with the help of suitable diagram.	**10**	**CO2**
Q 8	What is **satellite eclipse**? Calculate the total time of the eclipse and also the duration of its starting and ending when there is **Autumn** in India.	**10**	**CO4**

SECTION-C

Q 9	Compute the **uplink C/N** of a satellite with the following specification. Satellite transmitted power = 120 W Gain of the transmitted antenna = 18 dB Gain of the received earth antenna = 20 Transponder bandwidth = 500 MHz Uplink frequency = 14 GHz Boltzmann constant = - 226 dB Noise Temperature = 5K Antenna alignment loss = 2 W Feeding loss = 2 dB Average Rain loss = 3 dB	**20**	**CO3**

Q 10	A satellite is revolving over the equator in an **elliptical path** around the earth. If it takes 6 hours in one complete revolution, then compute its **altitude** at the perigee point and the apogee point and **speed** at the two points in kmph.
	         The perigee to apogee point distance = 5 : 2
	         The value of geo centric constant = 4×10^5 km^3/s^2.
	         The radius of the earth equatorial plane = 6400 km
	
	What be the **velocity** of the satellite if the **two focus** of the mentioned elliptical orbits become one.
		20	**CO4**