UNIVERSITY OF PETROLEUM
AND ENERGY STUDIES

UPES
THE NATION BUILDERS UNIVERSITY

End Semester Examination – April, 2017

Program/course:	**B. Tech ASE-AVE**	**Semester –**	**VIII**
Subject:	**Satellite Communication**	**Max. Marks**	**: 100**
Code :	**ELEG 307**	**Duration**	**: 3 Hrs**
No. of page/s: 02			

*Note: 1) **Answer** in **brief** and to the **points**.*
*2) Diagrams must be **neat** and **clear**.*

Attempt all questions.

Part A [2×10 = 20]

1. Fill the **blanks** with **appropriate word.**

   i. The latitude and longitude of Geo stationary satellite is……….& ……………
   ii. There are …………..minimum GPS satellite in one orbit and the minimum numbers of communication satellite to cover the globe is ………..
   iii. The two launch vehicle for INSAT are ……………&……………….
   iv. Remote sensing satellite are launched by …………… from ……………….
   v. Two places on the earth can have the ………..elevation angle, but …………..azimuth angle with respect to an INSAT?

2. Answer in **one or two** sentences only.

   i. The earth station/ DTH antenna is titled toward which direction in Delhi?
   ii. Why Sriharikota is the best place for launching of satellite.
   iii. What is maximum and minimum duration of geo stationary satellite eclipse
   iv. Find the relationship between EIRP of Earth station and $(C/N)_D$.
   v. If carrier to noise ratio for uplink and downlink of a typical IRS system is 16 dB & 6 dB respectively, then calculate the total C/N of a satellite link.

Part B [4×10 = 40]

3. 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 height of geostationary orbit.

4. How a satellite is placed in geo stationary orbit right from the launching site. Describe briefly with a neat diagram. Label all the orbits in which the transaction of satellite took place. Also state with valid reason the choice of launch and launch vehicle.

5. Briefly describe the operation of a single stage transponder system. Also illustrate the transponder link with the help of suitable diagram.

6. What is satellite foot point? Calculate the latitude in North and south hemisphere up to which the signal from a geo stationary satellite can be viewed.

Part C [10+15+15]

7. A and B are the two last/extreme points in the north hemisphere and south hemisphere respectively, up to which signals from a geo stationary satellite can be viewed. If a signal is send from A to the geo stationary satellite at 04:20:10 PM, then when will be it received at B from the satellite?

8. A satellite is revolving over the equator in an elliptical path around the earth. If height of the satellite at the apogee is 5 times than that at perigee. Compute its altitude and speed at these two points in kmph.
The value of geo centric constant $= 4×10^5$ km^3/s^2.
The diameter of the earth equatorial plane = 12800 km
Semi-major axis of the elliptical orbit = 15200 km

9. Compute the uplink C/N of a Geo stationary satellite with the following specification.

Earth station transmitted power	=	60 W
Gain of the transmitted antenna	=	10 dB
Gain of the satellite antenna	=	8 W
Transponder bandwidth	=	500 MHz
Uplink loss	=	195 dB
Boltzmann constant	=	- 226 dB
Noise temperature	=	5K

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*Note: 1) **Answer** in **brief** and to the **points**.*
*2) Diagrams must be **neat** and **clear**.*

Attempt all questions.

Part A   **[2×10 = 20]**

1.   Fill the **blanks** with **appropriate word.**

   a. The two launch vehicle for INSAT are ……………&………………
   b. Remote sensing satellite are launched by …………… from ……………….
   c. Two places on the earth can have the ………..elevation angle, but …………..azimuth angle with respect to an INSAT?
   d. The latitude and longitude of Geo stationary satellite is……….& ……………
   e. There are …………..minimum GPS satellite in one orbit and the minimum numbers of communication satellite to cover the globe is ………..

2.   Answer in **one or two** sentences only.

   a. Find the relationship between EIRP of Earth station and $(C/N)_D$.
   b. If carrier to noise ratio for uplink and downlink of a typical IRS system is 16 dB & 6 dB respectively, then calculate the total C/N of a satellite link.
   c. The earth station/ DTH antenna is titled toward which direction in Dehradun?
   d. Why Sriharikota is the best place for launching of satellite.
   e. The controlling of INSAT are done from which two places?

Part B   **[4×10 = 40]**

3.   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 radius
      of geostationary orbit.

4.   Briefly describe the operation of a double stage transponder system. Also illustrate the
      transponder link with the help of suitable diagram.

5.   How a satellite is placed in geo stationary orbit right from the launching site. Describe
      briefly with a neat diagram. Label all the orbits in which the transaction of satellite took
      place. Also state with valid reason the choice of launch and launch vehicle.

6. What is satellite coverage angle? Calculate the latitude in North and South hemisphere
      coverage in degree of a geo stationary satellite.

Part C   **[15+15+10]**

7.   A satellite is revolving over the equator in an elliptical path around the earth. If it takes
      8 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 = 6350 km

8.   Compute the downlink C/N of a Geo stationary satellite with the following
      specification.

Satellite transmitted power	=	60 W
Gain of the transmitted antenna	=	10
Gain of the received earth antenna	=	15
Transponder bandwidth	=	450 MHz
Downlink loss	=	204 dB
Boltzmann constant	=	- 226 dB
Noise temperature	=	4K

9.   Consider M and N are the two last/extreme points in the north hemisphere and south
      hemisphere respectively, up to which signals from a geo stationary satellite can be
      located. If a signal is send from M to the geo stationary satellite at 02:20:20 AM, then
      when will be it received at N from the satellite?

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