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B.TECH
(SEM. VII) THEORY EXAMINATION 2017-18
SATELLITE COMMUNICATION

*Time: 3Hours**Max. Marks: 100***Note:** Attempt all Sections. Assume missing data, if any.**SECTION A****1. Attempt all questions in brief: 10 x2 = 20**

- a. What do you understand by argument of perigee?
- b. Define inclination?
- c. Write uplink and downlink frequencies of satellite communication. Explain the reason why these frequencies are different?
- d. What do you mean by station keeping of satellite?
- e. Explain the ice effect in satellite communication.
- f. What is an EIRP?
- g. Write short note on GPS codes?
- h. Explain the position determination principle of GPS.
- i. What are the types of antennas used in spacecraft?
- j. Explain antenna beam width.

SECTION B**2. Attempt any three of the following: 10 x 3 = 30**

- a. (i) What are the elements of satellite communication? Explain each of them with a suitable block diagram.
(ii) List the orbital elements of a satellite and briefly explain them.
- b. (i) Derive the G/T ratio of earth station. What is the standard value for good quality of earth station?
(ii) A 6/4 GHz band communication satellite transponder requires a saturation flux density of -67.5 dBW/m^2 , when an input back-off of 11dB is employed. The spacecraft has a G/T of -11.6 dB/K . If the downlink saturated EIRP is 26.6 dBW, estimate the back-off required if an overall (C/No) of 92.6 dBHz has to be maintained. The earth station G/T is 40.7 dB/K and total losses may be assumed to be 196.7 dB.
- c. With the help of suitable diagram explain the satellite communication system architecture using VSAT. Also write the applications of VSAT.
- d. Explain the working of a Global Positioning System (GPS) receiver. Explain why a minimum of four satellites must be visible at an earth location utilizing the GPS system for position determination. What does the term dilution refer to?
- e. Briefly describe the types of antennas used for mobile satellite broadcasting. What are their technical requirements?

SECTION C**3. Attempt any one parts of the following:****10 x 1 = 10**

- a) What is meant by look angles? Explain them with reference to a geostationary satellite and the earth station.
- b) Satellite-1 in an elliptical orbit has the orbit semi major axis equal to 18000 km and satellite-2 has semi major axis equal to 24000 km. Determine the relationship between their orbital periods.

4. Attempt any one parts of the following:**10 x 1 = 10**

- a) Discuss the various satellite subsystems. Explain TTC and Antenna subsystem in detail.
- b) A satellite carrying an 11.7 GHz continuous wave (CW) beacon transmitter is located in geosynchronous orbit 38000 km from an earth station. The beacon's output power is 200 mW, and it feeds an antenna with 18.9 dB gain towards the earth station. The earth station receiving antenna aperture efficiency is 50 percent. The effective aperture area is 10 sq.mt. Calculate:
 - i. EIRP
 - ii. Path-loss
 - iii. Receiving antenna gain.

5. Attempt any one parts of the following:**10 x 1 = 10**

- a) What are the factors that affect the uplink design and the downlink design in geostationary satellites communication? Discuss in detail.
- b) Write brief notes on the advantages and disadvantages of using satellite in LEO, MEO and GEO for mobile satellite communications.

6. Attempt any one parts of the following:**10 x 1 = 10**

- a) Write short notes on GPS navigation message and GPS timing accuracy.
- b) Explain the working of Direct Broadcast Satellite (DBS) television network.

7. Attempt any one parts of the following:**10 x 1 = 10**

- a) Write short note on Wire Quadrifilar Helix Antenna (WQHA) for hand held terminals.
- b) Discuss the evolution of satellites for mobile communication system (MSB).