

END TERM EXAMINATION

EIGHTH SEMESTER [B.TECH] JULY-2023

Paper Code: ETEC-404

Subject: Satellite Communication

Time: 3 Hours

Maximum Marks :75

Note: Attempt five questions in all including Q. no.1 which is compulsory. Select one question from each unit.

Q1 Attempt all questions:

- (a) Discuss the performance characteristics of different altitude schemes. (5)
- (b) Why the uplink frequency is different from the downlink frequency? Also give the reason to keep higher uplink frequency. (5)
- (c) What are the advantages & disadvantages of satellite communication? (5)
- (d) What do you understand by transponder capacity? (5)
- (e) Why a small antenna is desirable for home receiver outdoor unit? (5)

UNIT-I

- Q2 (a) A satellite is orbiting in the equatorial plane with a period from perigee to perigee of 12 h. Given that the eccentricity is 0.002, calculate the semi-major axis. The earth's equatorial radius is 6378.1414 km. (6.5)
- (b) Comparisons are sometimes made between satellite and optical fiber communications systems. State briefly the areas of application for which you feel each system is best suited. (6)

OR

- Q3 (a) State Kepler's three laws of planetary motion. Illustrate in each case their relevance to artificial satellites orbiting the earth. (6.5)
- (b) The orbit for an earth-orbiting satellite orbit has an eccentricity of 0.15 and a semimajor axis of 9000 km. Determine (a) its periodic time; (b) the apogee height; (c) the perigee height. Assume a mean value of 6371 km for the earth's radius. (6)

UNIT-II

- Q4 (a) Explain what is meant by the earth eclipse of an earth-orbiting satellite. Why is it preferable to operate with a satellite positioned west, rather than east, of earth station longitude? (6.5)
- (b) How is a geostationary satellite launched to a GEO? Does the motion of Earth beneficial for GEO satellites? Justify. (6)

OR

- Q5 (a) Explain what is meant by rain rate and how this is related to specific attenuation. (6)
- (b) Describe the east-west and north-south station-keeping maneuvers required in satellite station keeping. What are the angular tolerances in station keeping that must be achieved? (6.5)

P.T.O.

UNIT-III

- Q6 (a) Explain what is meant by coding gain as applied to error correcting coding. When FEC coding is used on a digital link, a coding gain of 3 dB is achieved for the same BER as the uncoded case. What decibel reduction in transmitted carrier power does this imply. **(6)**
(b) Explain the principle and working of Satellite switched TDMA. **(6.5)**

OR

- Q7 (a) Explain in your own words how error detection and error correction differ. Why would forward error correction normally be used on satellite circuits? **(6.5)**
(b) Describe how convolution coding is achieved. State some of the main advantages and disadvantages of this type of code compared with block codes. <https://www.ggsipuonline.com> **(6)**

UNIT-IV

- Q8 Describe the main features of Radarsat. Explain what is meant by a "dawn to dusk" orbit and why the Radarsat follows such an orbit. **(12.5)**

OR

- Q9 (a) Describe the operation of a typical VSAT system. State briefly where VSAT systems find widest application. **(6)**
(b) 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 of position refer to? **(6.5)**

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