PAPER ID-411240

Roll No: | | | | | | | | | | | | | | |

MTECH
(SEM II) THEORY EXAMINATION 2023-24
ADVANCED SATELLITE COMMUNICATION

TIME: 3 HRS **M.MARKS: 70**

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. **Attempt *all* questions in brief.** **2 x 7 = 14**

a.	Explain the orbital effects in communication system performance.
b.	Explain Kepler's three laws of planetary motion.
c.	Discuss the types of antennas commonly used in spacecraft communication.
d.	Explain the basic principles of transmission theory.
e.	Illustrate the concept of pre-assigned FDMA.
f.	Explain the purpose of a reference burst in a TDMA system.
g.	Discuss the key features of Radarsat.

SECTION B

2. **Attempt any *three* of the following:** **7 x 3 = 21**

a.	Derive and explain the fundamental orbit equations governing the motion of a satellite around a celestial body.
b.	Describe the main components of a spacecraft's communication subsystem. How do these components work together to ensure reliable communication between the spacecraft and ground stations?
c.	Explain the principle of Frequency Division Multiple Access (FDMA). Also discuss the advantages and limitations of FDMA in comparison to other multiple access techniques.
d.	Write a short note on (a) Pre-assigned and Demand-Assigned TDMA (b) Speech Interpolation and Prediction.
e.	Describe the principle of Direct Broadcast Satellite (DBS) for television and radio transmission.

SECTION C

3. **Attempt any *one* part of the following:** **7 x 1 = 7**

(a)	Write a short note on (a) Look Angle Calculation (a) Satellite Visibility.
(b)	Describe the different types of launch vehicles and their roles in deploying satellites into orbit. Also discuss the performance characteristics of launch vehicles.

4. **Attempt any *one* part of the following:** **7 x 1 = 7**

(a)	Explain the function of earth stations in space communication. Also discuss how environmental factors and geographical location impact the performance of an earth station.
(b)	Explain the process of designing a satellite link to achieve a specified carrier-to-noise ratio (C/N). A satellite TV signal occupies the full 36MHz transponder bandwidth and is desired to provide a C/N ratio of 22dB at the earth station. If the downlink frequency is 4GHz and the other losses amount to 3.4dB, what

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		must be the G/T of the earth station if GRP is 37dBW.The path length is 40000km. (Boltzmann's constant K=1.38×10-23 J/K).

5. **Attempt any *one* part of the following:**   **7 x 1 = 7**

(a)	Write a short note on (a) Companded Single Side Band (SSB) (b) Over Deviation and Companding.
(b)	Define the concept of backoff in communication systems. Also describe the methods for measuring and calculating intermodulation noise.

6. **Attempt any *one* part of the following:**   **7 x 1 = 7**

(a)	Describe the process of downlink analysis in digital transmission systems using TDMA. What factors are considered when analyzing downlink performance?
(b)	Explain the principle of Time Division Multiple Access system. Also describe the frame structure in a TDMA system.

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

(a)	Explain the concept of the Global Positioning System (GPS) as the most widely used satellite navigation system. Also explore the various applications of GPS technology
(b)	Discuss the key components and architecture of a VSAT system.