Reg.No.:												

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 70055

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – JAN. 2026
Sixth Semester
Computer Science and Engineering
U19ECOE4 – SATELLITE COMMUNICATION
(Regulation 2019)

Time : Three Hours | Maximum : 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Outline the significance of the semi-major axis in orbital elements.	2	K2	CO1
2.	What is the Sub-satellite Point?	2	K1	CO1
3.	How is Effective Isotropic Radiated Power (EIRP) defined in satellite communication?	2	K1	CO2
4.	Why is the Attitude and Orbit Control System (AOCS) critical for satellite operations?	2	K4	CO2
5.	How do preassigned FDMA and demand-assigned FDMA differ in terms of frequency allocation?	2	K4	CO3
6.	Why is spectrum spreading important in CDMA systems?	2	K2	CO3
7.	Mention the key differences between a transmit and receive earth station.	2	K2	CO4
8.	How do polarization techniques enhance signal reception in TVRO systems?	2	K3	CO4
9.	Write short notes on polar orbiting satellites.	2	K1	CO5
10.	How does HEVC (H.265) improve upon previous MPEG standards in satellite broadcasting?	2	K4	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Discuss Kepler's Laws of Planetary Motion in the context of satellite orbits. Derive the relationship between the orbital period and the semi-major axis for a satellite in orbit. Further, explain how Newton's Laws of Motion and Universal Gravitation influence satellite motion and orbit.	13	K2	CO1
		(OR)			
	b)	Explain the concept of geostationary orbits and the significance of orbital elements in satellite communication systems. Discuss the factors that affect geostationary orbit characteristics, such as look angle determination, eclipse periods, and limits of visibility.	13	K2	CO1
12.	a)	Discuss the various subsystems in a satellite communication system, with particular emphasis on the power supply, attitude and orbit control, thermal control, propulsion, transponders, and antenna subsystems. How do these subsystems contribute to the overall functionality and stability of the satellite?	13	K2	CO2
		(OR)			
	b)	Provide a detailed analysis and design of a satellite communication link, considering the uplink and downlink performance. Explain the concept of EIRP (Effective Isotropic Radiated Power), transmission losses, and the link power budget equation. How are system noise, C/N (Carrier-to-Noise Ratio) calculations, inter-modulation, and interference handled in satellite communication systems?	13	K3	CO2
13.	a)	Explain the different multiple access techniques used in satellite communication systems, including FDMA, TDMA, and CDMA. Compare the uplink power requirements for FDMA and TDMA, and discuss their respective advantages and disadvantages in the context of satellite communication.	13	K2	CO3
		(OR)			
	b)	Discuss the principles and operation of CDMA (Code Division Multiple Access) in satellite communication systems, with a focus on DSS (Direct Sequence Spread Spectrum), code signals, and the processes of acquisition and tracking. Explain spectrum spreading and despreading in CDMA, and describe how CDMA throughput is calculated.	13	K2	CO3

14.	a)	Discuss the different types of earth stations in satellite communication systems, including TVRO (Television Receive-Only), MATV (Master Antenna Television), and CATV (Community Antenna Television) systems. Explain the role of transmit and receive earth stations in satellite communication, highlighting their functions, components, and operational principles.	13	K2	CO4
		(OR)			
	b)	Explain the use of satellites in networks, focusing on bandwidth, Asynchronous Transfer Mode (ATM) over satellite, and the challenges faced when using TCP over satellite links. How can TCP performance be enhanced over satellite channels, and what mechanisms, such as Split TCP, are used to improve throughput and reliability?	13	K2	CO4
15.	a)	Explain the concept of Direct Broadcast Satellite (DBS) systems. Discuss the key factors influencing DBS performance, including orbital spacing, power rating, the number of transponders, frequency and polarization, and transponder capacity. How do MPEG compression standards and forward error correction contribute to efficient digital television transmission?	13	K4	CO5
		(OR)			
	b)	Discuss the different satellite systems used for global communications and earth observation, including INTELSAT, INSAT, VSAT, Radar sat, GPS, and Orb comm. Compare their roles and applications in modern satellite networks, with an emphasis on their frequency usage, coverage, and technological characteristics.	13	K2	CO5

PART – C

(1 x 15 = 15Marks)

Q.No.			Questions	Marks	KL	CO
16.	a)	i.	What are the advantages and disadvantages of solar panels versus radioisotope thermoelectric generators (RTGs) in space missions?	8	K3	CO2
		ii.	Why is thermal control important for satellite performance, and how do active and passive thermal control systems differ?	7	K2	
			(OR)			

b) Determine the probability of false detection for the following values: N = 40, E = 5. 15 K3 CO2

Calculate the frame efficiency for an INTELSAT frame given the following information:

Total frame length = 120,832 symbols

Traffic bursts per frame = 14

Reference bursts per frame = 2

Guard interval = 103 symbols

Composition of preamble