



**Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026**  
**Satellite and Optical Communication**

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
 2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1				M	L	C
Q.1	a.	Write short note on : 1. Apogee and Perigee distance 2. Umbra and Penumbra region of an eclipse	4	L1	CO1	
	b.	Explain three Keplers law of planetary motion.	8	L2	CO1	
	c.	Illustrate the concept of Injection velocity and resulting satellite trajectories with neat diagrams and expressions.	8	L2	CO1	
<b>OR</b>						
Q.2	a.	A satellite is moving in an elliptical orbit with the major axis equal to 42000 km. If the perigee distance is 8000 km, find the apogee and the orbit eccentricity.	4	L1	CO1	
	b.	Describe different types of satellite orbit with respect to orientation of orbital plane and distance from earth.	8	L2	CO1	
	c.	A satellite launched with an injection velocity $V_1$ from a point above the surface of the earth at a distance P from center of earth attains an elliptical orbit with an apogee distance $A_1$ . The same satellite when launched with an injection velocity $V_2$ from the same perigee distance attains an elliptical orbit with an apogee distance $A_2$ . Derive the relationship between $V_1$ and $V_2$ in terms of P , $A_1$ and $A_2$ .	8	L2	CO1	
<b>Module – 2</b>						
Q.3	a.	Write short note on satellite subsystem.	5	L1	CO2	
	b.	Explain with neat diagrams solar energy driven power system.	7	L2	CO2	
	c.	Explain with suitable diagram, monopulse tracking and lobe switching techniques.	8	L2	CO2	
<b>OR</b>						
Q.4	a.	Write short note on Altitude and Orbit control.	5	L1	CO2	
	b.	Explain earth station architecture with generalized earth station block diagram.	7	L2	CO2	
	c.	Illustrate with neat schematic diagram, Tracking , Telemetry and Command subsystem.	8	L2	CO2	

Module – 3					
Q.5	a.	What are Communication related Application of satellites?	4	L1	CO3
	b.	Explain with neat block diagram transparent or bent pipe transponders.	8	L2	CO3
	c.	Describe with neat block diagram Satellite Cable Television.	8	L2	CO3
<b>OR</b>					
Q.6	a.	List out any 5 advantages of satellite over Terrestrial Networks.	4	L1	CO3
	b.	Explain with neat diagrams Direct To Home (DTH) Satellite Television.	8	L2	CO3
	c.	Describe with neat block diagram, basic elements of a Satellite Communication system.	8	L2	CO3
<b>Module – 4</b>					
Q.7	a.	Consider a multimode step index optical fiber that has a core radius of $25 \mu\text{m}$ , a core index of 1.48 and an index difference $\Delta = 0.01$ . Find the percentage of optical power that propagates in the cladding at 840 nm.	5	L1	CO4
	b.	Describe in detail about different fiber materials.	7	L2	CO4
	c.	Derive the expression for numerical aperture from Ray Theory.	8	L2	CO4
<b>OR</b>					
Q.8	a.	Consider a multimode silica fiber that has a core refractive index $n_1 = 1.480$ and a cladding index $n_2 = 1.460$ . Find i) Critical angle ii) the numerical aperture iii) the acceptance angle.	5	L1	CO4
	b.	Explain different types of bending losses.	7	L2	CO4
	c.	Illustrate with necessary diagram Mode theory for circular waveguide.	8	L2	CO4
<b>Module – 5</b>					
Q.9	a.	Explain the principle of Operation of PIN photodiode.	10	L2	CO5
	b.	Illustrate the concept of diffraction grating with necessary diagram.	10	L2	CO5
<b>OR</b>					
Q.10	a.	Explain with necessary diagram , the working principle of LASER diodes.	10	L2	CO5
	b.	Discuss about the Operational principles of WDM.	10	L2	CO5

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