B.E. INSTRUMENTATION AND ELECTRONICS ENGINEERING FOURTH YEAR SECOND SEMESTER - 2023

Subject Name : Instrumentation in Space Technology Time 3 hoursFull Marks 70

Attempt any five questions from below.

Q1	a.	Define the Chandrasekhar limit? (CO1)	1+2+3+ 4+4
	b.	Explain the process "Mixing Length Theory (CO1)	
	c.	Write about the key characteristics of a star. (CO2)	
	d.	Interpret on the assumptions made to justify The Standard Solar model (CO3)	
	e.	Paraphrase the significance of Solar Radio Flux & Mg II core-to-wing Ratio in Standard Solar Model (CO4)	
Q2	a.	Define, Zenith Angle, Antipode, Nadir, & Diurnal motion. (CO1)	2+2+3+ 3+4
	b.	How the star's luminosity can be used to measure the interstellar distance?(CO1)	
	c.	Illustrate the diagram of the Reflecting telescope and mounting and explain. (CO2)	
	d.	Calculate the distance between Los angeles and Kolkata? The coordinates of the Cities are Los Angeles =34.05220, -188.24370 and Kolkata 22.5726° , 88.3639° (CO4)	
	e.	Explain the construction, working principle and calibration of Faraday Cup? How does the energy loss of the particle in Matter influence the sensors' response to high energy particles? (CO3)	
Q3	a)	Define Directivity of an Antenna, Antenna Gain and Efficiency (CO1	2+2+3+ 3+4
	b)	Point out the constructional and operational differences of Discrete Electron Multiplier and Continuous Electron Multiplier? Explain with figure . (CO2)	
	c)	Draw a Block schematic diagram of the whole solar irradiance measurement system. (CO3)	
	d)	Distinguish between the radiometric type and thermometric type solar irradiance sensors. (CO3)	
	e)	State Keplar third law? Derive an expression of time period of an elliptical orbit.(CO4)	
Q4.	a)	Name the orbital elements and parameters. (CO1)	2+4+4+ 4
	b)	Write down the conditions a satellite must fulfil. Discuss the Electric and Ion Propulsion of a satellite. (CO2)	
	c)	Interpret on the *Eccentricity* of the Orbit.(CO3)	
	d)	A satellite launched with an injection velocity of V_1 from a point above the surface of the Earth at a distance r from the centre of the Earth attains an elliptical orbit with an apogee distance of R_1. The same satellite when launched with an injection velocity of V_2 from the same perigee distance attains an elliptical orbit with an apogee distance of R_2. Derive the relationship between V_1 and V_2 in terms of r , R_1 and R_2.(CO4)	
Q5.	a)	Define :Vernal Point (CO1)	2+3+3+ 6
	b)	Explain the law of cosine in spherical Geometry (CO2)	

c) Identify the properties for Eulerian triangles, i.e., those for which each side or angle does not exceed 180^{O} (CO2)

d) Poof that *the shortest path l on two points A and B on a Sphere is along an arc of great circle* (CO3)

Q6 a) Recognize the sourse of error in Space Flight Particle Instrument. (CO2) 2+2+5+5

b) If the goal is to compute moments of the particle distribution function, then restate additional errors arise from it. (CO4)

c) Write your understanding on Silicon Solid-State Detectors for detection of charged particles. (CO3)

d) Explain the function of Near Infrared Camera and Multi-Object Spectrometer in space telescope. (CO1)

Q7 a) Differentiate between Scintillators and Cherenkov Radiators (CO2) 4+4+3+3

b) How can solar radio burst be detected? Indicate the role of LPDA in low frequency radio burst detection. (CO4)

c) Explain the construction details of the Feed Arrangement of The parabolic dish Antenna. (CO1)

d) Design a Focal Length of Parabolic Reflector for a frequency of 2870 hz radio burst. (CO4)

Q8.

a) What is simple exponential smoothing? (CO1)

b) How the positional importance of the astronomical time series data is maintained with Simple Exponential Smoothing technique? (CO3)

c) How does Fractal Geometry say about the chaotic nature of any astronomical time series data? (CO4)

5+3+4