STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086
(For candidates admitted from the academic year 2019–20 & thereafter)

SUBJECT CODE: 19MT/ME/ES45

B. Sc. DEGREE EXAMINATION, APRIL 2023
BRANCH I – MATHEMATICS
FOURTH SEMESTER

COURSE : MAJOR ELECTIVE
PAPER : ELEMENTS OF SPACE SCIENCE
TIME : 3 HOURS **MAX. MARKS: 100**

SECTION-A

ANSWER ANY TEN QUESTIONS: **10 × 2 = 20**

1. Write the Napier's formula in spherical trigonometry.
2. Define Nautical twilight.
3. How are the secondaries to the celestial equator named as?
4. Define angle of obliquity.
5. What is astronomical refraction?
6. State the expression for geocentric parallax.
7. Define apogee and perigee.
8. State any two Kepler's law of planetary motion.
9. What are umbra and penumbra?
10. Define solar mean time.
11. Write the name of any two constellations.
12. What are meteors?

SECTION-B

ANSWER ANY FIVE QUESTIONS: **5 × 8 = 40**

13. Define a spherical triangle and prove that $\frac{\sin(A+B)}{\sin C} = \frac{\cos a+\cos b}{1+\cos c}$ where *ABC* is a spherical triangle.
14. Find the relation between Right Ascension and Longitude of the sun.
15. Define and derive the formula for calculating aberration.
16. Calculate the eccentricity of earth's orbit around sun.
17. How do we find the maximum number of eclipses in a year?
18. Discuss the steps to convert mean solar time into sidereal time. Express in sidereal time an interval of 16 *h* 18 *m* 24 *s* of meantime.
19. Describe morning, evening and circumpolar stars.

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SECTION-C

ANSWER ANY TWO QUESTIONS: **2 ×20 = 40**

20. i) Briefly explain the four-coordinate system to fix the position of a celestial body.
    ii) Calculate the duration of twilight on any day.

21. i) Derive the change in Right Ascension and declination of a body due to geocentric parallax.
    ii) Derive the Newton's deduction from Kepler's law.

22. i) Discuss about the standard times and the difference between local times.
    ii) Explain in brief the occurrence of solar and lunar eclipse.