SUBJECT CODE: 19MT/ME/ES45

B. Sc. DEGREE EXAMINATION, APRIL 2022
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. Define spherical triangle.
2. State Napier's rule I and II.
3. Define lunar and solar eclipse.
4. Prove that $\tan\delta = \tan\omega\sin\alpha$ where α is the right ascension and δ is the declination of the sun.
5. Define equinoctial points.
6. Describe the influence of temperature and pressure on refraction of celestial bodies.
7. Define latitude of a place.
8. Mention the limitation of measuring a celestial body using Geocentric parallax.
9. Define direct and retrograde motion of planets.
10. Define occultations.
11. Discuss the relation between sidereal time and mean time.
12. Express in mean solar time an interval of 16h. 21m. 8s. of sidereal time.

SECTION-B

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

13. In a spherical triangle ABC, show that $\dfrac{\sin(A+B)}{\sin C} = \dfrac{\cos a + \cos b}{1 + \cos c}$.
14. Describe dip of horizon and its effect.
15. Define right ascension of a celestial body with diagram and find the relation between right ascension and longitude of the sun.
16. State the comparison between geocentric parallax and refraction.
17. Describe total solar eclipse and its importance.
18. Determine the eccentricity of the earth's orbit around the sun.
19. Find the mean time corresponding to 12h 6m 37s sidereal time on 4 May 1940, given that mean time at sidereal noon was 9h 11m 35s.

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SECTION-C

ANSWER ANY TWO QUESTIONS: $2 \times 20 = 40$

20. (a) Prove the following: (i) any two sides of a spherical triangle are together greater than the third side and (ii) sum of the angles of a spherical triangle lies between 180° and 540°.

(b) Draw all the four celestial coordinate systems on the same figure and name its coordinates. $(8 + 12)$

21. (a) If the right ascension of the sun increases by $\Delta\alpha$ while its longitude increases by $\Delta \odot$, show that $\triangle \alpha = \triangle \odot \cos \omega \sec^2 \delta$ where ω is the angle of obliquity of the ecliptic and δ is the declination of the sun.

(b) Derive the effect of refraction on the right ascension and declination of a star $(8 + 12)$

22. (a) Find the sidereal time at Greenwich corresponding to mean time 10h. 13m. 40s. a.m. on a given date, given that the sidereal time of mean midnight was 5h. 15m. 42s.

(b) Derive Newton's deductions from Kepler's laws. $(8 + 12)$

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