

2021

Time : 3 Hours

Maximum Marks : 70

Candidates are required to give their answers in their own words as far as practicable.

Answer any five questions

D-264

- (a) Find the value of cosine of an angle of a spherical triangle in terms of cosines and sines of the sides.

- (b) Prove that in spherical triangle

$$\tan \frac{A}{2} = \sqrt{\frac{\sin(s-b) \sin(s-c)}{\sin s \sin(s-a)}}$$

- 2. (a) In spherical triangle prove that

$$\tan \frac{A+B}{2} = \frac{\cos \frac{a-b}{2}}{\cos \frac{a+b}{2}} \cot \frac{c}{2}$$

- (b) In any spherical triangle prove that :

$$\frac{\sin(A+B)}{\sin C} = \frac{\cos a + \cos b}{1 + \cos c}$$

- 3. (a) In a spherical triangle ABC, in which $\angle C = \frac{\pi}{2}$ prove that

$$\tan \frac{A}{2} \sin a = \sin c - \cos a \cos b$$

- (b) In a spherical triangle ABC, if $A = \frac{\pi}{5}$, $B = \frac{\pi}{3}$, $C = \frac{\pi}{2}$ show that $a + b + c = \frac{\pi}{2}$

- 4. (a) Explain Rising and Setting of Stars.

- (b) If h be the hour angle of a star at rising, then prove that

$$\tan^2 \frac{h}{2} = \frac{\cos(Q-\delta)}{\cos(Q+\delta)}$$

5. (a) What is the effect of refraction on sunrise and sunset ?

(b) If r in the horizontal refraction, show that on account of this the point of the compass where the sunrises is shifted by $\frac{\sin Q}{\cos(Q-\delta)\cos(Q+\delta)} \cdot r$, where Q is latitude.

6. (a) Obtain Kepler's Equation $E = me \sin E$ where m is the mean anomaly and E is the eccentric anomaly.

(b) Prove that if the forth and higher powers of e are neglected, then prove that $E = m + \frac{e \sin m}{1 - e \cos m} -$

$\frac{1}{2} \left\{ \frac{e \sin m}{1 - e \cos m} \right\}^m$ is a solution of Kepler's equation.

7. (a) Prove that the equation of time vanishes four times in an year.

(b) prove that the equation of time due to obliquity of ecliptic is max. when the longitude \odot of the sun is given by $\sin \odot = \frac{1}{\sqrt{2}} \sec \frac{E}{2}$

8. Discuss the effect of aberration on latitude and longitude of a star.

9. Find the nutation in right ascension and declination.

10. Find Geocentric parallax in right ascension and declination. Earth taken as spheroid.