

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI –600 034.
 B.Sc., DEGREE EXAMINATION – MATHEMATICS
 V SEMESTER – NOVEMBER 2002
MAT 508 ASTRONOMY

12.11.2002
 1.00 – 4.00

Max:100 marks

PART – A

Answer all questions.

(10 x 2 = 20 marks)

01. If ϕ is the latitude of a place, δ the declination of a celestial body and h its hour angle

when rising (or) setting show that $2 \sin^2 \left(\frac{n}{2} \right) = \frac{\cos(\phi - \delta)}{\cos \phi}$.

02. Write a note on Sun dial.

03. A star is seen to rise at the N.E. point. Find the latitude of the place in terms of δ .

04. Define “Stationary Points”.

05. Find the latitude of the place at which the shortest day is 9 hours long.

06. Write a note on mercury.

07. Find the condition for the twilight to last throughout night.

08. Define synodic month.

09. Discuss constellations of stars.

10. If α and β are the angles subtended between a star and the visible horizon at two heights ‘a’ and ‘b’ in the same vertical line, show that the radius of the earth is equal to

$$\left[\frac{\sqrt{2b - \sqrt{2a}}}{\beta - \alpha} \right]^2 \text{ nearly.}$$

PART – B

Answer any Five questions.

(5 x 8 = 40 marks)

11. Find the azimuth of a star at rising.

12. Define ‘Dip of the Horizon’ and obtain an expression for it.

13. Calculate the duration of twilight at a place of latitude ϕ , when the sun’s declination is δ .

14. Find the co-efficient of refraction by observing a circumpolar star.

15. In north latitude ϕ the sun whose declination is 15° S rises two hours before noon. Show

$$\text{that } \tan \phi = \frac{\sqrt{3} x (2 + \sqrt{3})}{2}.$$

16. Define Geo centric Parallax and derive a formula for the same.

17. Describe in detail about Solar and lunar eclipses.

18. Prove that aberration varies as the sine of earth's way.

PART – C

Answer any Two questions.

(2 x 20 = 40 marks)

19. a) Discuss in detail about the Co-ordinate systems used in astronomy.

b) Trace the changes in the co-ordinates of the sun in the course of a year. (12+8)

20. Discuss the changes in the duration of day and night at any place on the earth. Using the formula $\cos \delta = \sin \phi \tan \delta$.

21. a) Find the time taken by a star to rise from a small vertical distance x'' below the horizon.

b) Draw a diagram of the celestial sphere as seen at Trivandrum (latitude $8^{\circ} 30' N$) on the 10th April at 8 p.m. Showing therein the positions of the sun, the moon (aged 7 days) and a star of R.A. $6^h, 40^h$ and declination $30^{\circ} S$. (8+12)

22. a) State Kepler's laws of planetary motion and derive Kepler's third law from Newton's law of gravitation.

b) If the hour angles of a star of declination δ be H when its azimuth is A . and H' when its azimuth is $180^{\circ} + A$. Show that the latitude ϕ of the place of observation can be

found from the equation $\tan \phi \cos \left(\frac{H - H'}{2} \right) = \tan \delta \cos \left(\frac{H + H'}{2} \right)$. (12+8)
