23MCU524A

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2025
(Fifth Semester)

Branch – **MATHEMATICS WITH COMPUTER APPLICATIONS**

MAJOR ELECTIVE COURSE- I: ASTRONOMY

Time: Three Hours Maximum: 50 Marks

SECTION-A (5 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (5 x 1 = 5)

1 The period of one complete rotation of the earth about its axis or the period of one apparent rotation of the celestial sphere about the celestial axis is called a .....
(i) sidereal noon (ii) sidereal night
(iii) astronomical clock (iv) sidereal day

2 The terrestrial sphere is divided into a number of regions called the zones of earth by small circle parallel to the equator. These circles are called ..... circles.
(i) longitude (ii) latitude
(iii) centric (iv)arctic

3 Which of the following is the relation between horizontal parallax and angular radius of a body?
(i) $\frac{P}{\theta}=\frac{a}{r}$ (ii) $\frac{P}{\theta}=\frac{r}{a}$ (iii) $\frac{P}{\theta}=\frac{1}{r}$ (iv) $\frac{1}{\theta}=\frac{a}{r}$

4 The direction in which a body is seen from the centre of the sun is called its .....
(i) heliocentric longtitude (ii) geocentric direction
(iii) heliocentric direction (iv) mean anomaly

5 What is the epact of the year 1952?
(i) 2 (ii) 3 (iii) 5 (iv) 4

SECTION - B (15 Marks)
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 3 = 15)

6 a If a is sun's altitude in the prime vertical at a place of latitude φ and □ is its longitude, prove that $\sin\varphi=\sin$□ $\sin\omega\cos ec\alpha$

OR

b Prove that at any instant the sidereal time is given by the right ascension plus west hour angle of any celestial body expressed in time units at that instant.

7 a Find analytically the conditions for perpetual day and night.

OR

b Find an expression for Dip.

8 a The altitude of a star is observed and found to be the angle whose sine is 5/13. Calculate the true position of the star, assuming the amount of refraction at an altitude of 45° to be 58"2.

OR

b Determine the horizontal parallax of moon by meridian observations.

Cont...

9 a Derive Kepler's third law from Newton's law of gravitation.

OR

b Derive Kepler's equation.

10 a At the place on the Tropic of cancer, the moon's phase at the time of sun set on 21st March was 1/4. show that the altitude of the moon was then 60° assuming the moon to move on the ecliptic.

OR

b Find the minimum number of eclipses in a year.

SECTION -C (30 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 x 6 = 30)

11 a Trace the changes in the co-ordinates of the sun in the course of a year.

OR

b i) At a place in north latitude φ two stars A and B (declinations δ and δ_1 respectively) rise at the same moment and A transits when B is setting, prove that $\tan\varphi\tan\delta = 1 - 2\tan^2\varphi\tan^2\delta_1$.

ii) In a place of latitude 45° shows that the interval between a star's rising and the instant when it is due west is constant.

12 a If the declination of the sun changes from δ° to $\delta^\circ + s''$ between sunrise and sunset, show that the afternoon will be longer than the forenoon by $\frac{\sec\delta\sin\varphi}{\sqrt{\cos^2\varphi - \sin^2\delta}}\frac{s}{15}$ seconds, φ being the latitude of the place.

OR

b Find the duration of twilight.

13 a i) State the laws of refraction

ii) If r'' be the horizontal refraction, show that the point on the horizon where the sun rises is shifted by $r''\sin\varphi\sqrt{\sec(\varphi-\delta)+\sec(\varphi+\delta)}$ where δ is the declination of the sun and φ, the latitude of the place.

OR

b Discuss the changes in R.A. and declination of a body due to geocentric parallax.

14 a Obtain the Newton's deductions from Kepler's laws.

OR

b If t_1, t_2 are the hourly variations in the equation of time when the sun is at perigee and apogee, show that the eccentricity of earth's orbit is nearly $\frac{t_1 - t_2}{t_1 + t_2}\tan^2(\omega/2)$, assuming that the equinoctial line to be perpendicular to the apse line of earth's orbit.

15 a Discuss various kinds of lunar liberations.

OR

b Determine the maximum and minimum number of eclipses possible near a node of the lunar orbit.

Z-Z-Z END