2016

(6th Semester)

MATHEMATICS

Paper : MATH–364 (C)

(Astronomy)

Full Marks : 75

Time : 3 hours

(PART : B—DESCRIPTIVE)

(*Marks* : 50)

The figures in the margin indicate full marks for the questions

Answer **one** question from each Unit

UNIT—I

1. *(a)* In a spherical triangle *ABC*, prove that

$$\cos A \quad \frac{\cos a \quad \cos b \cos c}{\sin b \sin c} \qquad 5$$

(b) If A and A be the angles of an equilateral triangle and its polar respectively, prove that

$$\cos A \quad \cos A \quad \cos A \cos A \qquad 5$$

2. *(a)* If the angles of a spherical triangle be together equal to four right angles, prove that

$$\cos^2 \frac{a}{2} \quad \cos^2 \frac{b}{2} \quad \cos^2 \frac{c}{2} \quad 1 \qquad 5$$

(b) If *D* be the middle point of *AB* of a spherical triangle *ABC*, show that

$$\cos a \quad \cos b \quad 2\cos\frac{c}{2}\cos CD \qquad 5$$

UNIT—II

3. *(a)* If the declination of a star is greater than the latitude , prove that the star's greatest azimuth east or west is

$$\sin^{1}(\cos \ \sec \ ) \qquad 5$$

(b) Find the condition that twilight may last all night. 5

4. Two stars ($_1$, $_1$) and ($_2$, $_2$) have the same longitude. Prove that

$$\sin(_1 \quad _2) \quad \tan(\cos \ _1 \tan \ _2 \quad \cos \ _2 \tan \ _1)$$

where be the obliquity of the ecliptic. 10

UNIT—III

5. Derive Cassini's formula for atmospheric refraction. 10

6. Find the effect of parallax on longitude and latitude of a star. Hence show that the path of the star described on account of parallax is ellipse. 10

UNIT—IV

7. *(a)* Find the relation between synodic period and orbital period. 5

(b) If be the geocentric distance of a planet, show that the brightness of the planet is given by

$$\frac{C(^{2} \quad 2\ b \quad b^{2} \quad a^{2})}{2b^{2}}$$

where C is a constant, a and b are the heliocentric distances of the earth and the planet. 5

8. If and are the velocities of two planets in circular and coplanar orbits, show that the period of direct motion is to the period of retrograde motion as 180 : , where

cos 10

UNIT—V

9. Deduce the law of gravitation from Kepler's law of planetary motion. 10

10. Find the effect of the dip of the horizon on the times of rising and setting of a star. 10

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Subject Code : MATH/VI/12 (c)

Booklet No. A

Date Stamp .....

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To be filled in by the Candidate

DEGREE 6th Semester
(Arts / Science / Commerce / .....) Exam., **2016**

Subject .....

Paper .....

INSTRUCTIONS TO CANDIDATES

1. **The Booklet No. of this script should be quoted in the answer script meant for descriptive type questions and vice versa.**
2. **This paper should be ANSWERED FIRST and submitted within 1 (one) Hour of the commencement of the Examination.**
3. **While answering the questions of this booklet, any cutting, erasing, over-writing or furnishing more than one answer is prohibited. Any rough work, if required, should be done only on the main Answer Book. Instructions given in each question should be followed for answering that question only.**

To be filled in by the Candidate

DEGREE 6th Semester
(Arts / Science / Commerce / .....) Exam., **2016**

Roll No. .....

Regn. No. .....

Subject .....

Paper .....

Descriptive Type

Booklet No. B .....

Signature of Scrutiniser(s)

Signature of Examiner(s)

Signature of Invigilator(s)

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(6th Semester)

MATHEMATICS

Paper : MATH–364 (C)

(Astronomy)

(PART : A—OBJECTIVE)

(*Marks* : 25)

Answer **all** questions

SECTION—A

(*Marks* : 10)

Each question carries 1 mark

Put a Tick ☑ mark against the correct answer in the box provided :

1. Which of the following statements is not true?

(a) The section of a sphere by a plane is a circle ☐

(b) The sides and angles of a polar triangle are respectively supplements of the angles and sides of primitive triangle ☐

(c) The sides and angles of a polar triangle are respectively supplements of the sides and angles of primitive triangle ☐

(d) If the plane cutting the sphere passes through the centre of the sphere, then the corresponding section is called a great circle ☐

2. In any spherical triangle ABC if A $\frac{}{2}$, then

(a) $\sin b$ $\sin a \cos b$ ☐

(b) $\sin b$ $\sin a \sin B$ ☐

(c) $\sin b$ $\sin a \cos B$ ☐

(d) $\sin b$ $\cos a \sin B$ ☐

3. The angular distance of the star from the horizon measured along the vertical circle through the star is called

(a) azimuth of the star ☐

(b) altitude of the star ☐

(c) zenith distance of the star ☐

(d) latitude of the star ☐

4. A star whose declination is will not set or rise at the place of latitude , when

(a) 90 ☐

(b) 90 ☐

(c) ☐

(d) 90 ☐

5. The position of the body will not be affected by refraction when the observed zenith distance is equal to

(a) 0° ☐ *(b)* 45° ☐

(c) 60° ☐ *(d)* 90° ☐

6. The angle between real direction of the star and the direction of the earth's motion is called

(a) parallax ☐

(b) aberration ☐

(c) earth's way ☐

(d) None of the above ☐

7. If the line joining of two planets of radii a and b to one another subtends an angle at the sun and planets appear to each other to be stationary, then cos is equal to

(a) $\frac{\sqrt{ab}}{a \quad \sqrt{ab} \quad b}$ ☐

(b) $\frac{\sqrt{ab}}{\sqrt{a} \quad ab \quad \sqrt{b}}$ ☐

(c) $\frac{\sqrt{ab}}{a \quad \sqrt{ab} \quad b}$ ☐

(d) $\frac{\sqrt{ab}}{\sqrt{a} \quad ab \quad \sqrt{b}}$ ☐

8. If d be the elongation of the earth from the sun as seen from a planet, then the phase of the planet is

(a) $\frac{1 \quad \sin d}{2}$ ☐

(b) $\frac{1 \quad \sin d}{2}$ ☐

(c) $\frac{1 \quad \cos d}{2}$ ☐

(d) $\frac{1 \quad \cos d}{2}$ ☐

9. The planets which revolve outside the earth's orbit are called

(a) inferior planets ☐

(b) superior planets ☐

(c) satellites ☐

(d) None of the above ☐

10. The distance of the planet from the sun is called

(a) heliocentric distance ☐

(b) geocentric distance ☐

(c) astronomical unit of distance ☐

(d) None of the above ☐

SECTION—B

(*Marks* : 15)

Each question carries 3 marks

1. In a spherical triangle ABC, $C \quad \frac{}{2}$, then prove that

$\sin b \quad \tan a \cot A$

2. Given the observer's latitude , the declination and the hour angle H of a star, show that its altitude a can be calculated from the formula

$$\sin a \quad \sin \quad \sin \quad \cos \quad \cos \quad \cos H$$

3. Given the right ascension of the true sun , the sun's mean longitude l and its true longitude $\odot$, show that the equation of time is equal to

($\odot$) ($\odot$ l)

4. Define direct and retrograde motion.

5. If V_1 and V_2 are linear velocities of a planet at perihelion and aphelion respectively, then prove that

$$(1 \quad e)V_1 \quad (1 \quad e)V_2$$

where e is the eccentricity.

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