2 0 1 7

(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 **five** questions, taking **one** from each Unit

UNIT—I

1. *(a)* Prove that the sides and the angles of a polar triangle are respectively supplements of the angles and sides of primitive triangle. 5

(b) If $B \quad C \quad$, show that

$$\sin 2B \quad \sin 2C \quad 0$$ 5

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

$$\sin\frac{A}{2} \quad \sqrt{\frac{\sin(s \quad b)\sin(s \quad c)}{\sin b \sin c}}$$

where $2s \quad a \quad b \quad c$. 5

(b) In an equilateral spherical triangle *ABC*, show that

$$1 \quad 2\cos a \quad \cot^2\frac{A}{2}$$ 5

UNIT—II

3. *(a)* Given the right ascension , the declination and the obliquity of the ecliptic of a star, show that its latitude and longitude can be calculated from the formulas—

(i) $\sin \quad \cos \quad \sin \quad \sin \quad \cos \quad \sin$;

(ii) $\tan \quad \dfrac{\sin \quad \tan \quad \cos \quad \sin}{\cos}$ 3+3=6

(b) If *H* is the hour angle of a star at rising, then show that

$$\tan^2\frac{H}{2} \quad \frac{\cos(\quad)}{\cos(\quad)}$$ 4

4. If the zenith distance z of a star is less than the colatitude C, prove that

$$C \quad x \quad \cos^{\;1}(\cos z \;\; \sec y)$$

where

$$\tan x \quad \cot \quad \cos H \quad \text{and} \quad \sin y \quad \cos \quad \sin H$$

H being the hour angle. 10

UNIT—III

5. *(a)* Prove that if the declination of a star is unaffected by refraction at a given moment, azimuth is then a maximum. 4

(b) Find the effect of aberration on right ascension of a star. 6

6. If $\odot$ is the longitude of the Sun and is the right ascension, then show that the greatest value of $\odot$ occurs when $\tan \odot \quad (\sin \;)^{1/2}$ and $\tan \quad (\cos \;)^{1/2}$, where is the obliquity of the ecliptic. 10

UNIT—IV

7. Assuming the Venus and the Earth describe circular orbits in the ecliptic, show that Venus will appear the brightest at an elongation given by

$$\cos \quad \frac{2}{3}\{(3 \quad a^2)^{1/2} \quad a\}$$

where a is the heliocentric distance of Venus in astronomical unit. 10

8. If a and b are radii of the orbits of the Earth (E) and a superior planet P ; u and v their respective linear velocities, then prove that the square of the velocity of P, relative to E at a stationary point is

$$\frac{(u^2 \quad v^2)(bu \quad av)}{(bu \quad av)}$$

10

UNIT—V

9. *(a)* Deduce Kepler's third law from Newton's law of universal gravitation. 5

(b) Prove that the dip of the visible horizon at a height h above the earth's surface is $\sqrt{\frac{2h}{a}}$, a is the radius of the earth. 5

10. Show that in a place of latitude , the sunrise will be accelerated by

$$t \quad \frac{12}{}\sqrt{\frac{2h}{a}} \quad \frac{1}{\sqrt{\cos^2 \quad \cos^2}} \text{ hr}$$

at a top of a mountain of height h, being the declination of the Sun and a the radius of the earth. 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., **2017**

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., **2017**

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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2 0 1 7

(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. The section of a sphere by a plane is

(a) a parabola ☐

(b) a circle ☐

(c) an ellipse ☐

(d) a hyperbola ☐

2. One of the four parts formula in a spherical triangle ABC is

(a) $\sin C \sin B \quad \cos c \cot a \quad \sin B \cot A$ ☐

(b) $\sin C \sin B \quad \sin c \cot a \quad \cos B \cot A$ ☐

(c) $\cos C \cos B \quad \sin c \cot a \quad \sin A \cot B$ ☐

(d) $\cos C \cos B \quad \sin c \cot a \quad \sin B \cot A$ ☐

3. Which one of the following statements is not true?

(a) The altitude of the pole is equal to the latitude of that place. ☐

(b) The angle between the equator and the ecliptic is known as obliquity of ecliptic. ☐

(c) The angular distance of the star from the ecliptic measure along the secondary to the ecliptic through the star is called the longitude of the star. ☐

(d) If the declination and the longitude of a star are equal, its right ascension and latitude will also be equal. ☐

4. The evening twilight ceases when the Sun's zenith distance has become

(a) 18 ☐ (b) 72 ☐

(c) 90 ☐ (d) 108 ☐

5. 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 ☐

6. The equation of time arises due to

(a) variable motion of the Sun along the ecliptic ☐

(b) obliquity of the ecliptic ☐

(c) Both *(a)* and *(b)* ☐

(d) None of the above ☐

7. If S is the geocentric longitude of the planet, then the planet's motion is said to be stationary when ds / dt is

(a) positive ☐

(b) negative ☐

(c) 0 ☐

(d) None of the above ☐

8. If T_1 and T_2 be the periodic times of inferior and superior planets and S be the synodic period, then

(a) $\frac{1}{S} \quad \frac{1}{T_1} \quad \frac{1}{T_2}$ ☐

(b) $\frac{1}{S} \quad \frac{1}{T_1} \quad \frac{1}{T_2}$ ☐

(c) $\frac{1}{S} \qquad \frac{1}{T_1} \quad \frac{1}{T_2}$ ☐

(d) $S \quad T_1 \quad T_2$ ☐

9. The boundary of the earth's surface visible from any position is called the

(a) imaginary horizon ☐

(b) visible horizon ☐

(c) dip of horizon ☐

(d) celestial horizon ☐

10. Which of the following statements is true?

(a) Velocity of a planet is greatest when it is nearest to the Sun. ☐

(b) Velocity of the planet is least when it is nearest to the Sun. ☐

(c) Both *(a)* and *(b)* are true ☐

(d) Neither *(a)* nor *(b)* is true ☐

SECTION—B

(*Marks* : 15)

Each question carries 3 marks

1. In a right-angled polar triangle ABC, $\quad C \quad \frac{\ }{2}$, then prove that $\sin a \quad \sin A \sin C$.

2. Define altitude and zenith distance of a star and find the relation between them.

3. Where must be a star situated so as to have no displacement due to annual parallax?

4. If the line joining two planets to one another subtends an angle 60° at the Sun, when the planets appear to each other to be stationary, then show that

$$a^2 \quad b^2 \quad 7ab$$

where a and b are the distances of planets from the Sun.

5. State Kepler's laws of planetary motion.

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