[English Version]

[The answers of the Question Nos. ***1, 2, 3, 4*** *are to be written at the beginning of the answer-script mentioning the question numbers in the serial order. Necessary calculation and drawing must be given on the right hand side by drawing margins on the first few pages on the answer-script. Tables and Calculators of any type are not allowed. Approximate value of* π *may be taken as* $\frac{22}{7}$, *if necessary. Graph paper will be supplied with question paper. Arithmetic problems may be solved by algebraic method.]*

[Alternative Question No. 11 is given for Sightless Candidates on Page No. 16]

1. Choose the correct option in each case from the following questions : 1×6=6

(i) If a principal becomes double in 10 yrs., the rate of simple interest per annum is

(a) 5% (b) 10%

(c) 15% (d) 20%

(ii) Condition of two roots of a quadratic equation $ax^2 + bx + c = 0$ $(a > 0)$ will be equal in magnitude but opposite in sign

(a) $b = 0, c = 0$ (b) $b = 0, c > 0$

(c) $b = 0, c < 0$ (d) $b > 0, c = 0$

(iii) If average of 6, 7, x, y, 16 be 9, then

(a) $x + y = 21$ (b) $x + y = 16$

(c) $x - y = 21$ (d) $x - y = 19$

(iv) Arc of length 121 cm of a circle makes 77° angle at the centre of the circle then the radius of the circle will be

(a) 110 cm (b) 100 cm

(c) 90 cm (d) 70 cm

(v) Length of a side of a cube be a unit and length of the diagonal be d unit then the relation of a and d will be

(a) $\sqrt{2}\,a = d$ (b) $\sqrt{3}\,a = d$

(c) $a = \sqrt{3}\,d$ (d) $a = \sqrt{2}\,d$

(vi) $ABCD$ be a cyclic quadrilateral whose centre is O. BC is extended upto E. If $\angle DCE = 96°$ then the value of $\angle BOD$ will be

(a) 42° (b) 84°

(c) 142° (d) 168°

2. Fill up the blanks (any *five*) : 1×5=5

(i) If the ratio of principal and yearly amount be $8:9$, then yearly rate of interest is ________.

(ii) Conjugate surd of $(\sqrt{3}-5)$ is ________.

(iii) Two tangents at the end point of a diameter of a circle are mutually ________.

(iv) If $x = a \sec\theta$ and $y = b \cot\theta$ then $\frac{x^2}{a^2} - \frac{b^2}{y^2} =$ ________.

(v) The radius of a solid hemisphere is $3r$ unit, the area of total surface is ________.

(vi) The frequency of 1, 2, 3, 4, 5 are respectively 1, 2, 3, 4, f and their arithmetic mean is 4 then value of f is ________.

3. Write *True* or *False* (any *five*) : 1×5=5

(i) $\sin^2\theta = (\sin\theta)^2$, $0° < \theta < 90°$.

(ii) The length of a side of a largest cube be $4\sqrt{2}$ cm inscribed in a sphere of radius 4 cm.

(iii) The angle in the segment of a circle which is greater than semicircle is an obtuse angle.

(iv) If the Arithmetic mean of $x-3, x-1, 7, x, 2x-1, 3x-5$ be 7.5, then their median will be 3.

(v) If $x \propto \frac{1}{y}$ then $(xy)^{10}$ is a constant.

(vi) In a business, the ratio of capital of Raju and Asif is $5:4$. If Raju got Rs. 80 of total profit then Asif got Rs. 100.

4. Answer any *ten* questions : 2×10=20

(i) A and B started a business by investing Rs. 15,000 and Rs. 45,000 respectively. After 6 months B got a profit of Rs. 3,030, what is the profit of A ?

(ii) In a triangle ABC, a straight line parallel to BC intersects AB and AC respectively at P and Q. If $AP = 4$ cm, $QC = 9$ cm and if $PB = AQ$ then find the value of PB.

(iii) Two Chords AB and CD are equidistant from the centre of a circle O. If $\angle AOB = 60°$ and $CD = 6$ cm, find the radius of the circle.

(iv) If $\tan\theta + \cot\theta = 2$ then find the value of $\tan^7\theta + \cot^7\theta$.

(v) If x and y are positive real numbers then $\sec\theta = \frac{x}{y}$ is correct or not ? Give answer with reason.

(vi) For two right circular cylinders, if ratio of their heights be 1 : 2 and ratio of the circumference of the base be 3 : 4 then find the ratio of their volume.

(vii) Arithmetic mean of $x_1, x_2, \ldots\ldots x_n$ is $\bar{x}$. Prove that $\sum_{i=1}^{n}(x_i - \bar{x})^2 = \sum_{i=1}^{n} x_i^2 - n\bar{x}^2$.

(viii) If the rate of interest increases from 5.5% to 6% then the yearly interest increased by Rs. 49.50. Find the capital.

(ix) If the sum of the roots of the equation $x^2 - 4x = K(x - 1) - 5$ is 7 then find the value of K.

(x) If $(a + b) : \sqrt{ab} = 2:1$ then find $a:b$.

(xi) If the radius of a sphere be increased by 50% find the percentage increased of the volume.

(xii) $ABCD$ be a cyclic quadrilateral. If $AD = AB$, $\angle DAC = 60°$ and $\angle BDC = 50°$ then find the $\angle ACD$.

5. Answer any *one* question : 5

(i) If the rate of compound interest be 4% in the 1st year and 5% in the 2nd year, then find the interest of Rs. 25,000 for two years.

(ii) Three friends invest Rs. 4,800, Rs. 6,600 and Rs. 9,600 respectively in a business. 1st person received $\frac{1}{8}^{\text{th}}$ of the profit as salary for looking after the business and the remaining profit was distributed among them in the ratio of their capitals. If after one year 1st person received Rs. 780 find the amount received by other two.

6. Answer any *one* question : 3

(i) Solve : $b(c-a)x^2 + c(a-b)x + a(b-c) = 0$.

(ii) Digit in the ten's place of a two digit number is less by 3 than the digit in the unit place. Product of the digits is less than the number by 15. Find the number.

7. Answer any *one* question : 3

(i) If $(x^3 + y^3) \propto (x^3 - y^3)$, then prove that $(x^2 + y^2) \propto xy$.

(ii) If $x\left(2-\sqrt{3}\right)=y\left(2+\sqrt{3}\right)=1$ then find the value of $3x^2 - 5xy + 3y^2$.

8. Answer any *one* question : 3

(i) If $\frac{a+b-c}{a+b}=\frac{b+c-a}{b+c}=\frac{c+a-b}{c+a}$ and $a + b + c \neq 0$, then prove that $a = b = c$.

(ii) If $x=\frac{8ab}{a+b}$, then find the value of $\frac{x+4a}{x-4a}+\frac{x+4b}{x-4b}$.

9. Answer any ***one*** question : 5

(i) Prove that the front angle formed at the centre of a circle by an arc is double of the angle formed by the same arc at any point of the circle.

(ii) If two circles touch each other, prove that the point of contact lies on the line joining the centre of two circles.

10. Answer any ***one*** question : 3

(i) In the isosceles triangle ABC, $\angle B$ is a right angle. Bisector of the $\angle BAC$ intersects BC at D. Prove that $CD^2 = 2BD^2$.

(ii) O is a point inside a rectangle $ABCD$. Prove that $OA^2 + OC^2 = OD^2 + OB^2$.

11. Answer any ***one*** question : 5

(i) In $\Delta\, ABC$ the base $BC = 6$ cm, $\angle ABC = 60°$ and $AB = 8$ cm. Draw the circumcircle of the triangle.

(ii) Construct a square of equal area of an equilateral triangle of side 6 cm.

12. Answer any ***two*** questions : 3×2=6

(i) If the ratio of three angles of a triangle is 2:3:4 then determine the circular value of the greatest angle.

(ii) If $\tan\theta = \frac{4}{3}$, find the value of $\sin\theta + \cos\theta$.

(iii) If A and B are two complementary angles then prove that

$$(\sin A + \cos B)^2 = 1 + 2 \sin A \sin B.$$

13. Answer any *one* question : 5

(i) From the roof of the building the angle of depression of the top and foot of a lamp post are 30° and θ° respectively. If the ratio of the height of the building and the height of the lamp post be 3 : 2, then find the value of θ.

(ii) From the foot of a Tilla the angle of elevation of its top is 45°. By moving 100 m towards the Tilla along a slope of 30°, the angle of elevation of the top becomes 60°. Find the height of the Tilla.

14. Answer any *two* questions : 4×2=8

(i) The ratio of the length, breadth and height of a solid rectangular parallelepiped is 4 : 3 : 2 and area of the whole surface is 468 sq. cm. Find the volume of the parallelepiped.

(ii) The internal and external radius of a hollow cylinder of height 20 cm are 4 cm and 5 cm respectively. By melting this cylinder a solid cone of height equal to one third height of the cylinder is formed. Find the diameter of the base of the cone.

(iii) A hemispherical bowl of internal radius 9 cm is full of water. How many cylindrical bottles of diameter 3 cm and height 4 cm are required to fill this water ?

15. Answer any *two* questions : 4×2=8

(i) Find the arithmetic mean of the following distribution :

Class	5-14	15-24	25-34	35-44	45-54	55-64
Frequency	3	6	18	20	10	3

(ii) Making cumulative frequency (greater than type) distribution table of given data, draw Ogive on graph paper :

Class	100-120	120-140	140-160	160-180	180-200
Frequency	8	14	10	12	4

(iii) Find the mode of the following frequency distribution :

Marks obtained	less than 10	less than 20	less than 30	less than 40	less than 50	less than 60
Number of Students	8	15	29	42	60	70

[Alternative Question for Sightless Candidates]

11. Answer any *one* question : 5

(i) Describe the process of drawing circumcircle of a triangle.

(ii) Describe the process of drawing a square of equal area of an equilateral triangle.