

**Sub: Maths(028)**

**Marks:100**

**Time:3 hrs.**

**Q1.[A] State and prove Pythagoras theorem.**

**[4]**

**[B] Solve any two:-**

**[6]**

1. Factorize :-  $(a+b+c)(ab+bc+ca)-abc$ .
2. Factorize :-  $a^2(b+c)+b^2(c+a)+c^2(a+b)+3abc$
3. Simplify:-  $\left(\frac{x+5}{x^2-x-12}\right) - \left(\frac{x+3}{x^2+x-20}\right) + \frac{x^2+8x+16}{x^2+8x+15}$

**[C] Solve any two:-**

**[4]**

1.  $a^2 - b^2 - 3 - 2a - 4b$
2.  $4x^3 - 3 + 4x^2 - 5x$
3.  $x^3 - x^2 - 2xy - 4y^2 - 8y^3$

**[D] Solve any one:-**

**[2]**

1. Simplify:-  $x + 1 - \frac{x}{x+2} - \frac{x+1}{x + \frac{1}{x+2}}$

2. If  $\frac{x}{b^2 - c^2} = \frac{y}{c^2 - a^2} = \frac{z}{a^2 - b^2}$  then prove that  $x + y + z = 0$

**[E] Fill in the blanks:-**

**[4]**

1.  $f : z \rightarrow z, f(x) = x^2 \cdot (-1)^x$ . Then  $f(-2) = \underline{\hspace{2cm}}$ . {2, -2, 4}
2. The graph of  $f : \mathbb{R}^+ \cup \{0\} \rightarrow \mathbb{R}, f(x) = x+6$  is       . {line segment, line, ray}
3. The no. of decision boxes used in a flowchart to determine the greatest of three distinct numbers is       . { One, two, three}
4. A computer receives data through        { IPD, OPD, CPU}

**Q2[A] Prove :- In the same circle congruent chords are equidistant from the center of the circle.**

**[4]**

**[B] Solve any two:-**

**[6]**

1. If  $\frac{a^2 + ab + b^2}{c^2 + cd + d^2} = \frac{a^2 - ab + b^2}{c^2 - cd + d^2}$  (where  $a, b, c, d \neq 0$ ) then prove that  $a/b = c/d$  or  $a/b = d/c$ .
2. In  $\Delta ABC$ ,  $m\angle A = 90^\circ$ ,  $\overline{AD} \perp \overline{BC}$  and  $D \in \overline{BC}$ . Prove that AB is the geometric mean of BD and BC.
2. The monthly salary of an employee partially varies directly as the number of years of service put in by him and is partially constant. After 5 years of service, his salary is rs. 4325 and after 8 years of services, the salary is Rs. 4700. Find the number of years of services put in by him, when his salary is Rs. 5700.

**[C] Solve any two:-**

**[4]**

- The minimum percentage of passing in a public examination is 40. Four out of nine candidates fail and percentage obtained by the remaining candidates are 80, 57, 51, 68, 78. Find the median of the percentages secured by them.
- Observations of an ungrouped data are  $x_1, x_2$  and  $x_3$  and it is given that  $x_1 < x_2 < x_3$ . If the mean and median of the data are 30 and 20 respectively and if  $x_3 - x_1 = 50$ , then find the observation  $x_1, x_2$  and  $x_3$ .
- The grouped data relating to cars owned by families residing in a multistory building are given below. In the data, one frequency is missing. If the mean of the data is 2.32, find the missing frequency.

No. of Cars(x)	0	1	2	3	4
Number of families	4	-	6	11	3

**[D] Solve any one of the following:-**

**[2]**

- If the range of  $F: A \rightarrow N, f(x) = 25x - 11$  is  $\{14, 89\}$ , then find  $A$ .
- Let  $f: R \rightarrow R, f(x) = \frac{x^2 - 9}{x^2 + 9}$ , then find  $f(0)$  and  $f(-3)$

**[E] Fill in the blanks:-**

**[4]**

- $x + \frac{1}{x} = 2$  then  $x^3 + \frac{1}{x^3} = \underline{\hspace{2cm}}$ .
- If  $\frac{a}{b + 3c} = \frac{b}{c + 3a} = \frac{c}{a + 3b}$  and  $a + b + c \neq 0$  then each ratio is  $\underline{\hspace{2cm}}$ .  
{ 0, 1, 1/4 }
- The square of  $x$  varies directly as the cube of  $y$  and  $x=4$  when  $y=3$ . Then  $y = \underline{\hspace{2cm}}$  when  $x=1/2$ . { 1/3, 2/3, 3/4 }
- $\frac{\sin 59^\circ}{\cos 31^\circ} + \frac{\cos 20^\circ}{\sin 70^\circ} - \frac{2\cos 31^\circ}{\sin 59^\circ} = \underline{\hspace{2cm}}$ . { 0, 1, 2 }

**Q3[A] Prove that an angle inscribed in a semicircle is a right angle.**

**[4]**

**[B] Solve any two:-**

**[6]**

- The angle of elevation of a top of tree from a terrace of 10m. high building is  $11^\circ - 12'$ . If the building is 10m. away from the tree, find the height of the tree.  
(Use :  $\tan 11^\circ - 12' = 0.1980$ )
- The length of the minute hand of a watch is 21cm. Find the area of the region covered by it in traveling from 7 am to 7.05am.
- Two cylindrical vessels are filled with oil. The radius of one vessel is 15cm and its height is 25cm. The radius and height of the other vessel are 10cm. And 18cm. Respectively. Find the radius of a cylindrical vessel 33cm. in height, which will contain oil of the two given vessels.

**[C] Solve any two:-** **[4]**

1. Prove that  $\cot^4 \theta + \cot^2 \theta = \operatorname{cosec}^4 \theta - \operatorname{Cosec}^2 \theta$ .
2. If  $\sin \theta = a$  then find other trigonometrical ratios.
3. Evaluate :-  $2 \cot 45^\circ + \cos^3 60 - 2 \sin^4 60 + 3/4 \tan^2 30$ .

**[D] Solve any one:-** **[2]**

1. If  $y = a + b$  where  $a = 3$  and  $b \propto x$   $x = 4$  when  $y = 11$  when  $x = 10$  find  $y$ .
2. If  $3 \sin \theta + 5 \cos \theta = 5$ , then prove that  $(3 \cos \theta - 5 \sin \theta)^2 = 9$

**[E] Fill in the blanks:-** **[4]**

1. Find the sum and the product of the roots of quadratic equation  $ax^2 + bx + c = 0$  ( $a \neq 0$ )
2. If  $x^2 + \frac{421}{4} = 13x$ , then find  $\Delta$ .
3. Define:- Similarity of Triangles.
4. Define:- Adjacent Line Segment.

**Q4[A]  $\triangle ABC \sim \triangle PQR$  and  $\overline{AD}$  and  $\overline{PM}$  are their medians. Prove that  $\overline{ABXP} = \overline{PQXAD}$ .** **[4]**

**[B] solve any two:-**

1. Simplify:-  $\left( \frac{1}{12x^2 + 31x + 20} + \frac{1}{6x^2 + 17x + 12} \right) + \frac{1}{8x^2 + 22x + 15}$
2. Find the median of the following data:-

Class	0-19	20-39	40-59	60-79	80-99	100-119
Frequency	12	18	38	17	8	7

3. The mean of a grouped data is 51.9. If  $\sum f_i U_i = 12$ ,  $n = 100$  and  $c = 20$  then find the assumed mean  $A$ .

**[C] Solve any two:-** **[4]**

1.  $\overline{PQ}$  is a tangent to  $\odot(O, r)$  touching at point  $R$ . If  $m\angle IRQ = 30^\circ$  and  $\overline{ST}$  is a diameter, find  $m\angle PRS$ .
2. In a  $\odot(O, r)$  chords  $\overline{BD}$  and  $\overline{CD}$  are congruent and  $m\angle DBC = 25^\circ$ , find the measure of  $\angle BOC$ .
3.  $\overline{AB}$  and  $\overline{CD}$  are two parallel chords of  $\odot(O, r)$  such that  $AB = 10$ ,  $CD = 24$ . If the chords are on the opposite sides of the centre and the distance between them is 17, find the radius of the circle.

**[D] Solve any One:-** **[2]**

1. For what values of  $K$  are the roots of the equation  $x^2 - 2(5 + 2k)x + 3(7 + 10k) = 0$
2. The product of a cricketers age 8 years ago and 12 years hence is 576. Find his present age.

[E] Fill in the blanks:-

[4]

1. Define:- Segment of a circle.
2. Define:- Tangent of a circle.
3. The curved surface area of a sphere is  $64\pi$  sq.cm then its diameter is \_\_\_\_\_ cms.
4. Radius of base and height of cylinder are same then the volume of a cylinder of 5cm height is \_\_\_\_\_  $x\pi$  cu.cm.

Q5[A] AB is given. Construct right angled  $\Delta PQR$  such that the length of the Hypotenuse  $PR = 5AB$  and  $PQ = 3AB$ . Write steps of construction. [4]

[B] Attempt any two:-

[6]

1.  $x \propto y$  &  $y \propto z$ . Prove that  $x^2 + y^2 + z^2 \propto xy + yz + zx$ .

2. Solve :-  $6 \left( x^2 + \frac{1}{x^2} \right) - 25 \left( x - \frac{1}{x} \right) + 12 = 0$

3. A mail train takes 3 hours less than a passenger train for covering a distance of 600Km. If the speed of the passenger train is 10Km/hr less than that of the mail train, find the speed of each train.

[C] Attempt any two:-

[4]

1.  $\Delta ABC \sim \Delta LMN$ . Perimeters of  $\Delta ABC$  and  $\Delta LMN$  are respectively 14 and 10. If  $MN = 2.5$ , then find  $BC$ .

2. M is a point on  $\overline{AB}$  such that  $AM = \frac{3}{2} MB$ . By taking  $\overline{AM}$  and  $\overline{MB}$  as one of sides

of equilateral triangles  $\Delta PAM$  and  $\Delta QMB$  are constructed. Then area of  $\Delta PAM$  is how many times area of  $\Delta QMB$ .

3.  $\square ABCD$ , is a square. If  $BD = 8\sqrt{2}$  then find the perimeter of  $\square ABCD$ .

[D] Answer any one:-

[2]

1. The perimeter of a rhombus is 68. If the length of one diagonal is 30, find the length of other diagonal.
2. Find the volume of a metal used in a hollow sphere having its inner & outer radii 3cm & 5cm respectively.

[E] The length of chord  $\overline{AB}$  of a circle with radius  $r$  is twice the length of a chord  $\overline{CD}$  whereas the distance of  $\overline{CD}$  from the centre is twice the distance of  $\overline{AB}$  from the center. Prove that  $r = \frac{\sqrt{5}}{2} CD$ .

(OR)

Attempt the following:-

[4]

1. Explain the division of the plane of a circle by the circle.
2. The vertices of square PQRS lie on  $\odot(O, r)$ . If  $PQ = 8$ , then find  $r$ .
3. In a circle with centre P, points B and D lie on major  $\overline{AC}$  s.t  $m\angle ABC = 40$ . If  $\overline{DB}$  is perpendicular to  $\overline{AC}$ , then find  $m\angle DAC$ .
4. If  $\overline{AB}$  is a diameter of  $\odot(p, 7.3)$ , then find  $\overline{AB}$ .