2016

MATHEMATICS

Total marks : 80 Time : 3 hours

General Instructions:

i) Approximately 15 minutes is allotted to read the question paper and revise the answers.

ii) The question paper consists of 22 questions.

iii) All questions are compulsory.

iv) Internal choice has been provided in some questions.

v) Marks allocated to every question are indicated against it.

N.B: Check that all pages of the question paper is complete as indicated on the top left side.

SECTION - A

1. **Choose the correct answer from the given alternatives.**

(a) A quadratic polynomial with zeros 2 and –3 can be written as **1**

(i) x^2+2x-3 (ii) x^2-3x-6

(iii) x^2+x-6 (iv) x^2-x+6

(b) In the linear equation $ax+by=c$, if $a\neq 0$, $b=0$ and $c=0$, then the graph of this equation is **1**

(i) the y-axis (ii) the x-axis

(iii) a line parallel to x-axis (iv) a line parallel to y-axis

(c) The discriminant of the quadratic equation $2x+\frac{4}{x}=9$ is **1**

(i)113 (ii) 49 (iii) 0 (iv) –113

(d) The n^{th} term of the A.P. 6, 10, 14, 18, ... is **1**

(i) $2-4n$ (ii) $2+4n$ (iii) $4n-2$ (iv) $4n+2$

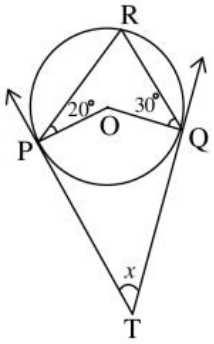
(e) In the right ΔABC right angled at B, cosec A is equal to **1**

(i) $\frac{AB}{AC}$ (ii) $\frac{BC}{AC}$ (iii) $\frac{AC}{BC}$ (iv) $\frac{AC}{AB}$

(f) The difference between the abscissa and the ordinate of two points in a plane are $2a$ and $2b$ respectively. The distance between these two points is **1**

(i) $\sqrt{a^2+b^2}$ (ii) $2\sqrt{a^2+b^2}$ (iii) $4a^2+4b^2$ (iv) a^2+b^2

(g) TP and TQ are tangents to the adjoining circle with centre O. $\angle RPO = 20°$ and $\angle RQO = 30°$. Then the value of x is **1**



(i) 100° (ii) 80° (iii) 60° (iv) 50°

(h) The perimeter of a quadrant circle is 50 cm. The radius of the circle is **1**
(i) 88 cm (ii) 28 cm (iii) 22 cm (iv) 14 cm

(i) The slant height of a frustrum of a cone of radii 10 cm, 4 cm and height 8 cm is **1**
(i) 10 cm (ii) 12 cm (iii) 14 cm (iv) 18 cm

(j) The probability that an ordinary year selected at random will contain 53 Mondays is **1**
(i) $\frac{2}{7}$ (ii) $\frac{1}{7}$ (iii) $\frac{1}{2}$ (iv) 0

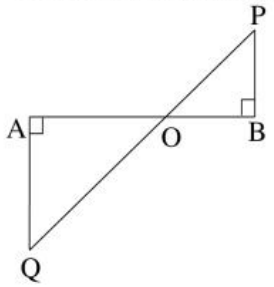
Section – B

2. If α and β be the distinct roots of the quadratic equation $3x^2 - (m+n)x - 4p - 1 = 0$, find the value of p such that $3\alpha - \frac{4}{\beta} = 0$ **2**

3. Given that $\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$, find the value of tan 75° **2**

4. Find the value of k, if the points A(2, 3), B(4, k) and C(6, –3) are collinear. **2**

5. In the figure given below, QA and PB are perpendicular to AB. If AO = 10 cm, BO = 6 cm and PB = 9 cm, then find the value of AQ. **2**



6. The circumference of a circle is 220 cm. Find the area of the sector of that circle whose central angle is 36° **2**

Section – C

7. **a.** If α, β are the zeros of the quadratic polynomial $x^2 - 9$, form the quadratic polynomial whose zeros are $\frac{3\alpha}{\beta}$ and $\frac{3\beta}{\alpha}$

Or **3**

b. Determine whether the quadratic equation $\frac{3}{4}x^2 - 8x + 3 = 0$ has real roots and if so, find the roots by using quadratic formula.

8. Solve the following system of linear equation by cross-multiplication method:

$$\frac{5}{x-1} + \frac{1}{y-2} = 2$$
$$\frac{6}{x-1} - \frac{3}{y-2} = 1$$

3

9. The last term of an A.P. is 120. It's first term and common difference are 20 and 5 respectively. Find the sum of the A.P. **3**

10. If $\tan\theta = \frac{2mn}{m^2 - n^2}$, find the values of sin θ and sec θ with respect to the sides of a right-angled triangle. **3**

11. **a.** Prove that $\left(1+\cot^2\theta\right)+\left(1+\frac{1}{\cot^2\theta}\right)=\frac{1}{\sin^2\theta-\sin^4\theta}$

Or **3**

b. Prove that $\cos\left(40°-\theta\right)-\sin\left(50°+\theta\right)+\frac{\cos^2 40°+\cos^2 50°}{\sin^2 40°+\sin^2 50°}=1$

12. **a.** A boy is standing on the deck of an anchored ship which is 15 m above the sea level. He observes that the angle of elevation of the top of a hill as 60° and the angle of depression of the base of the hill as 30°. Calculate the distance of the base of the hill from the ship and also the height of the hill. [Use $\sqrt{3}=1.732$]

Or **3**

b. A pole 5 m high is fixed on the top of a tower. From a point A on the ground, the angle of elevation of the top of the pole is 60° and from the top of the tower, the angle of depression of the point A is 45° . Find the height of the tower. [Use $\sqrt{3}=1.732$]

13. Draw a line AB of length 9 cm. Taking A as centre, draw a circle of radius 4 cm and taking B as centre, draw another circle of radius 3 cm. Construct tangents to each circle from the centre of the other circle. (Traces of construction only is required.) **3**

14. **a.** Two circles touch internally. The sum of their areas is 116π cm^2 and the distance between their centres is 6 cm. Find the radii of the circles.

Or **3**

b. A horse is tethered at one corner of a squared-shaped grass field of side 21 m by means of a 7 m long rope. Find:
(i) the area it can graze,
(ii) the ungrazed area if the rope were 14 m long.

15. Find the median of the weights of 30 students of a class. **3**

Weight (in kg)	40-45	45-50	50-55	55-60	60-65	65-70	70-75
No. of students	2	3	8	6	6	3	2

16. **a.** A box contains 8 dozen oranges out of which 8 are rotten. An orange is selected at random. Find the probability of getting:
(i) a good orange,
(ii) a rotten orange

Or **3**

b. Two dice are rolled simultaneously. Find the probability of getting:
(i) a sum greater than 7,
(ii) same number on both dice.

Section – D

17. **a.** Draw the graphs of the equations $x - y + 1 = 0$ and $3x + 2y - 12 = 0$. Determine the coordinates of the vertices of the triangle formed by these lines and the x-axis.

Or **5**

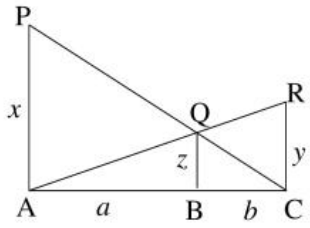
b. The area of a rectangle gets reduced by 9 square units if its length is reduced by 5 units and the breadth is increased by 3 units. If we increase the length by 3 units and the breadth by 2 units, the area is increased by 67 square units. Find the length and breadth of the rectangle.

18. **a.** The points A(0, –1), B(–2, 3), C(6, 7) and D(8, 3) are the vertices of a quadrilateral. Identify the name of the quadrilateral ABCD with reasons.

Or **5**

b. The line segment joining the points P(3, 3) and Q(6, –6) is trisected at the points A and B such that A is nearer to P. If A also lies on the line given by $2x + y + k = 0$, find the value of k.

19. **a.** In the adjoining figure, PA, QB and RC each is perpendicular to AC such that PA = x, RC = y, QB = z, AB = a and BC = b. Prove that: $\frac{1}{x} + \frac{1}{y} = \frac{1}{z}$



Or **5**

b. State and prove Thales theorem.

20. **a.** Angle between two tangents PQ and PR from a point P to a circle with centre O is right angle. If PQ + PR = 8 cm, find the diameter of the circle.

Or **5**

b. Prove that the opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle.

21. **a.** A solid is composed of a cylinder with hemispherical ends. The total height of the solid is 19 cm and the diameter of the cylinder is 7 cm. Find the volume and the surface area of the solid.

Or **5**

b. A semi-circular metal sheet of diameter 28 cm is bent into an open conical cup. Find the capacity of the cup. [Use $\sqrt{147} = 12.12$]

22. **a.** Find the mean of the following data using Step-deviation method:

Marks obtained	No. of students
Less than 30	6
Less than 40	24
Less than 50	49
Less than 60	71
Less than 70	88
Less than 80	100

[Take assumed mean = 45]

Or **5**

b. The total sales contributed by different counters in a departmental store during a month was:

Counter	Sale (`)
Electrical	3,50,000
Hardware	2,50,000
Men's wear	2,00,000
Ladies wear	3,00,000
Toys	1,00,000

Represent this information in a pie-chart by rounding-off the values (not on graph paper). Also shade and label the different sectors.

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