

**NOTE: Four possible answers A, B, C and D to each question are given. The choice which you think is correct, fill that circle in front of that question with Marker or Pen ink. Cutting or filling two or more circles will result in zero mark in that question.**

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Q1.

1. An equation which remains unchanged when  $x$  is replaced by  $\frac{1}{x}$  is called a/an:
  - (A) exponential equation
  - (B) reciprocal equation
  - (C) radical equation
  - (D) quadratic equation
2. If  $b^2 - 4ac < 0$ , then the roots of  $ax^2 + bx + c = 0$ , are:
  - (A) irrational
  - (B) rational
  - (C) imaginary
  - (D) real
3.  $\alpha^2 + \beta^2$  is equal to:
  - (A)  $\alpha^2 - \beta^2$
  - (B)  $\frac{1}{\alpha^2} + \frac{1}{\beta^2}$
  - (C)  $(\alpha + \beta)^2 - 2\alpha\beta$
  - (D)  $\alpha + \beta$
4. The third proportional of  $x^2$  and  $y^2$  is:
  - (A)  $\frac{y^2}{x^2}$
  - (B)  $x^2y^2$
  - (C)  $\frac{y^4}{x^2}$
  - (D)  $\frac{y^2}{x^4}$
5. If  $a : b = x : y$ , then invertendo property is:
  - (A)  $\frac{a}{x} = \frac{b}{y}$
  - (B)  $\frac{a}{a-b} = \frac{x}{x-y}$
  - (C)  $\frac{a+b}{b} = \frac{x+y}{y}$
  - (D)  $\frac{b}{a} = \frac{y}{x}$
6. Partial fraction of  $\frac{x-2}{(x-1)(x+2)}$  are of the form:
  - (A)  $\frac{A}{x-1} + \frac{B}{x+2}$
  - (B)  $\frac{Ax}{x-1} + \frac{B}{x+2}$
  - (C)  $\frac{A}{x-1} + \frac{Bx+C}{x+2}$
  - (D)  $\frac{Ax+B}{x-1} + \frac{C}{x+2}$
7. The range of  $R = \{(1,3), (2,2), (3,1), (4,4)\}$  is:
  - (A)  $\{1,2,4\}$
  - (B)  $\{3,2,4\}$
  - (C)  $\{1,2,3,4\}$
  - (D)  $\{1,3,4\}$
8. Point  $(-1, 4)$  lies in the quadrant:
  - (A) I
  - (B) II
  - (C) III
  - (D) IV
9. The most frequent occurring observation in the data set is called:
  - (A) mode
  - (B) median
  - (C) harmonic mean
  - (D) arithmetic mean
10.  $\sec^2\theta =$  \_\_\_\_\_ :
  - (A)  $1 - \sin^2\theta$
  - (B)  $1 + \tan^2\theta$
  - (C)  $1 + \cos^2\theta$
  - (D)  $1 - \tan^2\theta$
11. The symbol for a triangle is denoted by:
  - (A)  $<$
  - (B)  $\Delta$
  - (C)  $\perp$
  - (D)  $\odot$
12. Tangents drawn at the ends of diameter of a circle are \_\_\_\_\_ to each other.
  - (A) parallel
  - (B) non-parallel
  - (C) collinear
  - (D) perpendicular
13. An arc subtends a central angle of  $40^\circ$ , then the corresponding chord will subtend a central angle of:
  - (A)  $20^\circ$
  - (B)  $40^\circ$
  - (C)  $60^\circ$
  - (D)  $80^\circ$
14. The portion of a circle between two radii and an arc is called:
  - (A) sector
  - (B) segment
  - (C) chord
  - (D) perpendicular
15. The measure of the external angle of a regular hexagon is:
  - (A)  $\frac{\pi}{3}$
  - (B)  $\frac{\pi}{2}$
  - (C)  $\frac{\pi}{6}$
  - (D)  $\frac{3\pi}{4}$

Marks: 60

**SUBJECTIVE TYPE (PART- I)**

Time :2.10 Hours

Q2. Write short answers to any SIX (6) questions:

(6×2=12)

- (i) Define reciprocal equation.
- (ii) Write in standard form  $\frac{1}{x+4} + \frac{1}{x-4} = 3$
- (iii) Define 'Synthetic Division'.
- (iv) Write the quadratic equation having the roots  $3 + \sqrt{2}$ ,  $3 - \sqrt{2}$
- (v) Evaluate  $\omega^{37} + \omega^{38} + 1$
- (vi) Without solving, find sum and product of the roots of quadratic equation  $(a+b)x^2 - ax + b = 0$
- (vii) Define 'Direct Variation'.
- (viii) Find the fourth proportion to 8, 7, 6
- (ix) Find 'x'  $3x - 2 : 4 :: 2x + 3 : 7$

Q3. Write short answers to any SIX (6) questions:

(6×2=12)

- (i) Define fraction.
- (ii) Resolve into partial fractions  $\frac{3x+3}{(x-1)(x+2)}$
- (iii) Find sets X and Y if  $X \times Y = \{(a,a),(b,a),(c,a),(d,a)\}$
- (iv) If  $Y = \{-2, 1, 2\}$ , then make two binary relations for  $Y \times Y$ .
- (v) Define range of relation.
- (vi) If  $A = \{1,2,3,4,5,6\}$  and  $B = \{2,4,6,8\}$ , then prove that  $A \cup B = B \cup A$
- (vii) The salaries of five teachers are as follows, find the mean salaries 11500, 12400, 15000, 14500, 14800
- (viii) Define standard deviation.
- (ix) For the following data find harmonic mean:

4	8	5	12	X
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Q4. Write short answers to any SIX (6) questions:

(6×2=12)

- (i) Define coterminal angle.
- (ii) Convert  $\frac{13\pi}{16}$  into degree.
- (iii) Prove that  $\cos^4 \theta - \sin^4 \theta = \cos^2 \theta - \sin^2 \theta$
- (iv) Define zero dimension.
- (v) Define circumcircle.
- (vi) Define tangent.
- (vii) Define chord of the circle.
- (viii) Define circumangle.
- (ix) Define vertices.

**(PART - II)**

Note: Attempt any THREE questions. Question number 9 is compulsory.

(3×8=24)

- Q5. (a) Solve:  $\sqrt{x+1} + \sqrt{x-2} = \sqrt{x+6}$  4
- (b) Solve the simultaneous equations:  $4x^2 - 5y^2 = 6$        $3x^2 + y^2 = 14$  4

- Q6. (a) If  $\frac{a}{b} = \frac{c}{d} = \frac{e}{f}$  ( $a, b, c, d, e, f \neq 0$ ), then by using K-method show that:  $\frac{a}{b} = \sqrt{\frac{a^2 + c^2 + e^2}{b^2 + d^2 + f^2}}$  4

- (b) Resolve  $\frac{7x+4}{(3x+2)(x+1)^2}$  into partial fractions. 4

- Q7. (a) If  $A = \{1,2,3,4,5,6\}$ ,  $B = \{2,4,6,8\}$  and  $C = \{1,4,8\}$ , then prove that  $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$  4

- (b) Find standard deviation 'S' of the set of numbers: 12, 6, 7, 3, 15, 10, 18, 5 4

- Q8. (a) Prove that:  $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \frac{\sin\theta}{1-\cos\theta}$  4

- (b) Draw two circles with radii 2.5 cm and 3cm. If their centres are 6.5 cm apart, then draw two direct common tangents. 4

- Q9. Prove that A straight line drawn from the centre of a circle to bisect a chord (which is not a diameter) is perpendicular to the chord. 8

- (OR) Prove that the measure of a central angle of a minor arc of a circle is double than that of the angle subtended by the corresponding major arc.

**NOTE:** Four possible answers A, B, C and D to each question are given. The choice which you think is correct, fill that circle in front of that question with Marker or Pen ink. Cutting or filling two or more circles will result in zero mark in that question.

Q1.

15

1. The length of a diameter of a circle is \_\_\_\_\_ times the radius of the circle.  
(A) 1 (B) 2 (C) 3 (D) 4
2. The arcs opposite to incongruent central angles of a circle are always:  
(A) congruent (B) incongruent (C) parallel (D) perpendicular
3. Radii of a circle are:  
(A) all equal (B) all un-equal  
(C) double of the diameter (D) half of any chord
4. Sum of the deviations of the variable 'X' from its mean is always:  
(A) zero (B) 1 (C) same (D) 2
5. A set with no element is called:  
(A) empty set (B) sub set (C) singleton set (D) supper set
6. In a proportion  $a : b :: c : d$  'a' and 'd' are called:  
(A) means (B) extremes (C) third proportional (D) fourth proportional
7.  $\frac{1}{\alpha} + \frac{1}{\beta}$  is equal to: (A)  $\frac{1}{\alpha}$  (B)  $\frac{1}{\alpha} - \frac{1}{\beta}$  (C)  $\frac{\alpha - \beta}{\alpha\beta}$  (D)  $\frac{\alpha + \beta}{\alpha\beta}$
8. The number of terms in a standard quadratic equation  $ax^2 + bx + c = 0$  is:  
(A) 1 (B) 2 (C) 3 (D) 4
9. The circumference of a circle is called:  
(A) chord (B) segment (C) boundary (D) diameter
10. A line which has two points in common with a circle is called:  
(A) sine of a circle (B) cosine of a circle (C) tangent of a circle (D) secant of a circle.
11. The number of elements in power set  $\{1,2,3\}$  is:  
(A) 4 (B) 6 (C) 9 (D) 8
12.  $\frac{x^3 + 1}{(x - 1)(x + 2)}$  is \_\_\_\_\_:  
(A) a proper fraction (B) an improper fraction (C) an identity (D) a constant term
13. The union of two non-collinear rays which have common end point is called:  
(A) an angle (B) a degree (C) a minute (D) a radian
14. Find 'x' in proportion  $4 : x :: 5 : 15$ :  
(A)  $\frac{75}{4}$  (B)  $\frac{4}{3}$  (C)  $\frac{3}{4}$  (D) 12
15. Cube roots of '-1' are:  
(A)  $-1, -\omega, -\omega^2$  (B)  $-1, \omega, -\omega^2$  (C)  $-1, -\omega, \omega^2$  (D)  $1, -\omega, -\omega^2$

Marks: 60

**SUBJECTIVE TYPE (PART- I)**

Time :2.10 Hours

**Q2. Write short answers to any SIX (6) questions:**

(6×2=12)

- (i) Solve  $x^2 - 11x = 152$  by factorization.
- (ii) Solve  $5x^2 = 30x$  by factorization.
- (iii) Evaluate  $\omega^{37} + \omega^{38} - 5$
- (iv) If  $\alpha, \beta$  are the roots of the equation  $4x^2 - 5x + 6 = 0$ , then find the value of  $\alpha^2\beta^2$
- (v) Write the quadratic equation having roots  $1 + i, 1 - i$
- (vi) Define synthetic division.
- (vii) Find the value of  $p$  if the ratios  $2p + 5 : 3p + 4$  and  $3 : 4$  are equal.
- (viii) If  $y \propto \frac{1}{x}$  and  $y = 4$  when  $x = 3$ , find  $x$  when  $y = 24$
- (ix) Find mean proportional between 20 and 45.

**Q3. Write short answers to any SIX (6) questions:**

(6×2=12)

- (i) Resolve into partial fractions  $\frac{3x + 3}{(x - 1)(x + 2)}$
- (ii) Define identity.
- (iii) If  $A = \{0, 2, 4\}$ ,  $B = \{-1, 3\}$ , then find  $A \times A$  and  $B \times B$ .
- (iv) Define intersection of sets.
- (v) If  $A = \{1, 2, 3, 4, 5\}$  and  $B = \{2, 4, 5, 6, 8\}$ , then find  $A \cap B$  and  $A \cup B$ .
- (vi) Write De-Morgan's laws.
- (vii) Define moving averages.
- (viii) Find geometric mean of the observations 2, 4, 8 by using basic formula.
- (ix) The marks of seven students in mathematic are 45,60,74,58,65,63,49. Calculate arithmetic mean.

**Q4. Write short answers to any SIX (6) questions:**

(6×2=12)

- (i) Define 'Coterminal Angle'.
- (ii) Convert  $\frac{13\pi}{6}$  radian to degree measure.
- (iii) Prove that  $\frac{\sin\theta + \cos\theta}{\cos\theta} = 1 + \tan\theta$
- (iv) Define 'Right Angle'.
- (v) What is major arc of a circle?
- (vi) Define secant.
- (vii) Define segment of a circle.
- (viii) Define 'Chord of a Circle'.
- (ix) Define 'Polygon'.

**(PART - II)**

**Note: Attempt any THREE questions. Question number 9 is compulsory.**

(3×8=24)

**Q5. (a) Solve the equation:  $5x^{\frac{1}{2}} = 7x^{\frac{1}{4}} - 2$**  4

**(b) Prove that:  $x^3 + y^3 = (x + y)(x + \omega y)(x + \omega^2 y)$**  4

**Q6. (a) Using theorem of componendo-dividendo, find the value of  $\frac{x + 2y}{x - 2y} + \frac{x + 2z}{x - 2x}$  if  $x = \frac{4yx}{y + z}$ .** 4

**(b) Resolve  $\frac{7x + 4}{(3x + 2)(x + 1)^2}$  into partial fractions.** 4

**Q7. (a) If  $A = \{1, 2, 3, 4, 5, 6\}$ ,  $B = \{2, 4, 6, 8\}$  and  $C = \{1, 4, 8\}$ , then prove that** 4

$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$$

**(b) The marks of seven students in mathematics are as follows. Determine variance:** 4

Students	1	2	3	4	5	6	7
Marks	45	60	74	58	65	63	49

**Q8. (a) Verify that:  $\frac{1 + \sin\theta}{1 - \sin\theta} - \frac{1 - \sin\theta}{1 + \sin\theta} = 4 \tan\theta \sec\theta$**  4

**(b) Inscribe a circle in an equilateral triangle ABC with each side of length 5cm.** 4

**Q9. Prove that, two chords of a circle which are equidistant from the centre, are congruent.** 8

**(OR) Prove that, the measure of a central angle of a minor arc of a circle, is double that of the angle subtended by the corresponding major arc.**