

Write Serial No. of your answer book _____

Time Allowed : 30 Minutes

Maximum Marks : 20

Signature of Deputy Supdt. _____

Note : Use this paper to write the answers to the objective questions. No mark will be awarded for cutting, over-writing or using a pencil. This paper must be tagged with the answer-book.

1. Some possible answers to each statement are given below. Tick (✓) mark the correct answer : 20

- (i) If n is a prime number, then \sqrt{n} is :
 (Real number. Rational number. Irrational number. Complex number.)
- (ii) $P \wedge q$ represents : (Disjunction. Conjunction. Conditional. Quantifier.)
- (iii) $(AB)^{-1} = (AB , BA , A^{-1}B^{-1} , B^{-1}A^{-1})$
- (iv) A homogeneous system of linear equations has :
 (Finite solutions. Unique solutions. Infinite solutions. Two solutions.)
- (v) Sum of four fourth roots of unity is : (1 , -1 , 0 , i)
- (vi) Equations having same solutions are called : (Exponential equations. Radical equation. Simultaneous equations. Reciprocal equations.)
- (vii) Partial fractions of $\frac{1}{x^2 - 1}$ are of type : ($\frac{A}{x+1} + \frac{B}{x-1}$, $\frac{A}{x-1} + \frac{B}{(x-1)^2}$, $\frac{A}{x+1} + \frac{B}{(x+1)^2}$, $\frac{A}{x-1} + \frac{B}{x-1}$)
- (viii) If in an A.P $a_n = \frac{n}{2n+1}$, then a_4 is equal to : (4 , 3 , $\frac{4}{3}$, $\frac{4}{9}$)
- (ix) Geometric mean between 2 and 8 is : (2 , 8 , 4 , 16)
- (x) $\sum_{k=1}^n k = :$ (nk , $\frac{n(n+1)}{2}$, $\frac{k(k+1)}{2}$, k^n)
- (xi) If A and B are disjoint events, then $P(A \cup B) =$
 ($P(A) + P(B)$, $P(A) + P(B) - P(A \cup B)$, $P(A) + P(B) - P(A \cap B)$, $P(A) - P(B)$)
- (xii) $0!$ is equal to : (0 , 1 , 10 , 100)
- (xiii) Expansion of $(8 - 2x)^{-1}$ is valid if : ($|x| > 4$, $|x| < 4$, $|x| = 0$, $|x| = 4$)
- (xiv) θ° is measured in :
 (Circular system. Sexagesimal system. Radian measure. Rotation measure.)
- (xv) Sum of all angles in a triangle is equal to : (90° , 180° , 270° , 360°)
- (xvi) Period of $\sin 3x$ is : (3π , 2π , $\frac{\pi}{3}$, $\frac{2\pi}{3}$)
- (xvii) Angle below the surface line is called angle of :
 (Right angle. Oblique angle. Depression. Elevation.)
- (xviii) The greatest angle is opposite to :
 (Smallest side. Greatest side. Same side. Right side.)
- (xix) $\tan^{-1} A - \tan^{-1} B =$
 $\tan^{-1} \frac{AB}{1+AB}$, $\tan^{-1} \frac{A-B}{1+AB}$, $\tan^{-1} \frac{A-B}{1-AB}$, $\tan^{-1} \frac{AB}{1-AB}$)
- (xx) Equations, containing at least one trigonometric function is called :
 (Exponential equation. Partial equation. Trigonometric equation. General equation.)

Note : All questions are/attempted on the answer book.

SECTION – I

2. Write any TWENTY FIVE short answers of the following questions :

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- (i) Find the multiplicative inverse of $(-4, 7)$
- (ii) Find modulus and conjugate of $z = 1 - i\sqrt{3}$
- (iii) Explain set of natural number is neither monoid nor a group w.r.t. “1”
- (iv) Define conjunction and disjunction of two statements P and q.
- (v) If $A = \{1, 2, 3, 4, 5, \}$ and $B = \{4, 5, 6, 7, 8, 9, \}$ then find $A \cap B$ and $B - A$.
- (vi) If $\begin{bmatrix} 1 & 0 \\ 1 & -1 \end{bmatrix} = A$ show that $A^4 = I_2$
- (vii) Define symmetric and hermitian matrix.
- (viii) If $A = \begin{bmatrix} 2 & 5 & -1 \\ 3 & 4 & 2 \\ 1 & 2 & -2 \end{bmatrix}$ find $|A|$
- (ix) Solve $x^2 + 7x + 12 = 0$
- (x) Evaluate $w^{28} + w^{29} + 1$
- (xi) Discuss the nature of roots of $25x^2 - 30x + 9 = 0$
- (xii) α, β are roots of $5x^2 - x - 2 = 0$ form the equation whose roots are $\frac{3}{\alpha}$ and $\frac{3}{\beta}$
- (xiii) Find partial fractions of $\frac{3x}{(x-1)(x+2)}$
- (xiv) Define conditional equation and improper rational fraction.
- (xv) If the n th term of the A.P. is $(3n - 1)$ find the A.P?
- (xvi) Sum the series $3 + (-1) + 1 + \dots$ upto 16 terms.
- (xvii) Find value of r if $a_4 = \frac{8}{27}$ and $a_7 = \frac{-64}{729}$ of a G.P.
- (xviii) Sum the series $1 + 2x + 4x^2 + \dots \infty$.
- (xix) Find two G.ms. between 1 and 8.
- (xx) Find 8th term of H.P. $\frac{1}{2}, \frac{1}{5}, \frac{1}{8}, \dots$
- (xxi) How many different 4 digit numbers can be formed out of the digits 1, 2, 3, 4, 5, 6 when no digit is repeated?
- (xxii) ${}^nC_{10} = \frac{12 \times 11}{2}$ find n
- (xxiii) There are 5 green and 3 red balls in a box, one ball is taken out. What is probability that the ball is green.
- (xxiv) find first three terms in the expansion of $(\frac{a}{2} - \frac{2}{a})^6$ by using binomial theorem.

(Turn Over)

(2)

2. (xxv) Neglecting square and higher powers of x show that $\frac{\sqrt{1+2x}}{\sqrt{1-x}} = 1 + \frac{3x}{2}$

(xxvi) Show that the inequality $4^n > 3^n + 4$ is true for $n = 3, 4$

(xxvii) Find r when $\ell = 56$ cm, $\theta = 45^\circ$

(xxviii) $\sin \theta = -\frac{1}{\sqrt{2}}$ and terminal arm of the angle is not in Quadrant III, find values of $\tan \theta$ and $\cos \theta$.

(xxix) Prove that $\sin\left(\theta + \frac{\pi}{6}\right) + \cos\left(\theta + \frac{\pi}{3}\right) = \cos \theta$

(xxx) Prove that $\sin 2\alpha = 2\sin \alpha \cos \alpha$

(xxxi) What is the range and domain of the cotangent function?

(xxxii) At the top of a cliff 80 m high, the angle of depression of a boat is 12° . How far is the boat from the cliff?

(xxxiii) If in a triangle ABC $\beta = 60^\circ$, $\gamma = 15^\circ$, $b = \sqrt{6}$ find a

(xxxiv) Show that $r_2 = s \tan\left(\frac{\beta}{2}\right)$

(xxxv) If sides of triangle ABC $a = 34$, $b = 20$, $c = 42$ find area of the triangle.

(xxxvi) Find the value of $\tan\left(\sin^{-1}\left(\frac{-1}{2}\right)\right)$

(xxxvii) Solve the equation $\cot^2 \theta = \frac{1}{3}$

SECTION - II

Note : Attempt any THREE questions.

3. (a) Show that the set consisting of elements of the form $(a + \sqrt{3}b)$ (a, b are rationals) is an abelian group w.r.t. addition. 5

(b) Solve the equation $\sqrt{x+8} + \sqrt{x-3} = \sqrt{12x+13}$ 5

4. (a) Solve the system of linear equations $2x - y + z = 8$, $x + 2y + 2z = 6$, $x - 2y - z = 1$ by Cramer's rule. 5

(b) Find the values of n and r when ${}^{n-1}C_{r-1} : {}^nC_r : {}^{n+1}C_{r+1} = 3 : 6 : 11$ 5

5. (a) Sum the series $3 + 5 - 7 + 9 + 11 - 13 + 15 + 17 - 19 + \dots$ to $3n$ terms. 5

(b) If x is so small that its square and higher power by neglected, then show that 5

$$\frac{(9+7x)^{\frac{1}{2}}}{4+5x} - \frac{(16+3x)^{\frac{1}{4}}}{5} = \frac{1}{4} - \frac{17}{384}x$$

6. (a) Draw the graph of $y = \sin\left(\frac{x}{2}\right)$ for $x \in [0, 2\pi]$ 5

(b) Express $\cos A + \cos 3A + \cos 5A + \cos 7A$ as a product. 5

7. (a) Solve the triangle ABC in which $a = 53$, $\beta = 88^\circ 36'$, $\gamma = 31^\circ 54'$ 5

(b) Prove that $r = \frac{\Delta}{s}$ with usual notations. 5