

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) $(-1)^{\frac{-21}{2}}$ is equal to : ($-i$, i , 1 , -1)
- (ii) If A, B are non empty sets, then $A \cup B$ equals
(A , $B \cup A$, φ , B)
- (iii) A square matrix is symmetric if A' equals : (A , $-A$, A^2 , $\frac{A}{2}$)
- (iv) Let $A = \begin{bmatrix} 3 & -1 \\ 2 & 1 \end{bmatrix}$ then $|A|$ equals : (4 , 3 , 5 , 1)
- (v) For what value of k will equation $x^2 - kx + 4 = 0$ have sum of roots equal to product of roots :
(3 , -2 , -4 , 4)
- (vi) For equal roots of $ax^2 + bx + c = 0$ ($b^2 - 4ac$) will be : (Negative , Zero , 1 , 2)
- (vii) Types of rational fractions are : (Three , Two , Four , Infinite)
- (viii) Arithmetic Mean between $\sqrt{2}$ and $3\sqrt{2}$ is : ($\sqrt{2}$, $2\sqrt{2}$, 6 , 3)
- (ix) Harmonic Mean between a, b is : ($\frac{ab}{a+b}$, $\frac{a+b}{ab}$, $\frac{2ab}{a+b}$, $\frac{a-b}{ab}$)
- (x) Reciprocals of terms of A sequence form :
(Geometric sequence. Arithmetic sequence. Harmonic sequence. Not any sequence.)
- (xi) If $S = \{1, 2, 3, 4\}$, $A = \{1, 2\}$ $P(A)$ is : (2 , 4 , 1 , $\frac{1}{2}$)
- (xii) In how many ways can 6 keys be arranged on a key ring : (6 , 840 , 120 , 5)
- (xiii) Second term in the expansion of $(1 - 2x)^{\frac{1}{3}}$ is : ($\frac{x}{2}$, $\frac{x}{3}$, $\frac{2x}{3}$, $\frac{-2x}{3}$)
- (xiv) One radian is equal to : (45° , 50° , 60° , 57.296°)
- (xv) $\sin\theta$ equals : ($2\sin(\frac{\theta}{2})$, $\sin(\frac{\theta}{2})\cos(\frac{\theta}{2})$, $2\cos^2(\frac{\theta}{2})$, $2\sin(\frac{\theta}{2})\cos(\frac{\theta}{2})$)
- (xvi) Period of $\tan(\frac{x}{3})$ is : (π , 2π , 3π , $\frac{\pi}{2}$)
- (xvii) If in a Right angled triangle base = 30.8 , hypotenuse = 37.2 then $\cos \alpha$ will be :
($.7032$, $.8280$, $.7513$, $.8655$)
- (xviii) Value of circumcircle R is : ($\frac{abc}{2\Delta}$, $\frac{3\Delta}{abc}$, $\frac{\Delta^2}{abc}$, $\frac{abc}{4\Delta}$)
- (xix) If $\sin^{-1} 1 = \alpha$ then value of α is : ($\frac{\pi}{2}$, $\frac{\pi}{3}$, $\frac{\pi}{4}$, π)
- (xx) An equation containing trigonometric function is called :
(Exponential equation. Algebraic equation.
Radical equation. Trigonometric equations.

Note : All questions are to be attempted on the answer book.

SECTION – I

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

50

- (i) Check whether or not the set $\{1, -1\}$ is closed w.r.t. addition and multiplication.
- (ii) If $z = a + ib$, show that $(z - \bar{z})^2$ is real number.
- (iii) Show that multiplication is a binary operation in the set $(1, w, w^2)$ but addition is not a binary operation in this set, where w is a cub root of unity.
- (iv) Convert the theorem $(A \cap B)' = A' \cup B'$ to logical form.
- (v) Use distributive law to prove that $A \cap (A \cup B) = A \cup (A \cap B)$
- (vi) If $A = \begin{bmatrix} 5 & 3 \\ 1 & 1 \end{bmatrix}$, find A^{-1}
- (vii) Without expansion, show that $\begin{vmatrix} 2 & 3 & -1 \\ 1 & 1 & 0 \\ 2 & -3 & 5 \end{vmatrix} = 0$
- (viii) If $A = \begin{bmatrix} i & 1+i \\ 1 & -1 \end{bmatrix}$ show that $A + (\bar{A})'$ is hermitian..
- (ix) Solve $x^2 - 2x - 899 = 0$ by completing the square.
- (x) Use factor theorem to prove that $x - a$ is a factor of $x^n - a^n$.
- (xi) Find the discriminant of the equation $x^2 + (mx + c)^2 = a^2$
- (xii) A number consists of two digits x and y whose product is 8. If the digits are interchanged, the resulting number exceeds the original number by 18? Write two relations between x and y .
- (xiii) Resolve into partial fractions $\frac{1}{(1 - ax)(1 - bx)}$
- (xiv) Resolve $\frac{1}{(x - 3)^2}$ into partial fractions.
- (xv) If $a_{n-3} = 2n - 5$, find the n th term of the sequence?
- (xvi) A clock strikes once when its hour hand is at one, twice when it is at two and so on. How many times does the clock strike in twelve hours?
- (xvii) Find G.M. between -2 and 8 .
- (xviii) Convert the recurring decimal $0.\overset{\circ}{2}\overset{\circ}{3}$ into an equivalent common fraction.
- (xix) If 5 is the H.M. between 2 and b find b ?
- (xx) How many different 4 – digit numbers can be formed out of the digits 1, 2, 3, 4, 5 ?
- (xxi) Find the value of n if ${}^nC_4 = {}^nC_5$
- (xxii) One chit out of 30 containing the names of 30 students of a class of 18 boys and 12 girls is taken out at random for nomination as monitor. What is the probability that the monitor is a boy?
- (xxiii) How many arrangements of the letters of PAKPATTAN ^{taken} / altogether can be made?

(2)

2. (xxiv) State binomial theorem for positive integers.

(xxv) Expand $(8 - 2x)^{-1}$ upto 3 terms.(xxvi) If x is so small that its square and higher powers can be neglected, then show that :

$$\frac{\sqrt{1+2x}}{\sqrt{1-x}} \approx 1 + \frac{3}{2}x$$

(xxvii) Convert $75^\circ 6' 30''$ to radians.(xxviii) $\cos\theta = \frac{9}{41}$ and terminal arm of the angle θ is not in I Quadrant, find values of $\tan\theta$ and $\operatorname{cosec}\theta$.(xxix) Prove that $\frac{\sin 2\alpha}{1 + \cos 2\alpha} = \tan \alpha$ (xxx) Express $\sin 5x + \sin 3x$ as product.(xxxi) Prove that cosine is periodic function of period 2π .

(xxxii) A vertical pole is 8m high and the length of its shadow is 6 m. What is the angle of elevation of the sun at that moment?

(xxxiii) In a triangle ABC, $B = 12.5$, $C = 23$, $\alpha = 38^\circ 20'$, find value of a .(xxxiv) Find area of triangle ABC in which $b = 37$, $c = 45$, $\alpha = 30^\circ 50'$ (xxxv) Sides of a triangle ABC are 17, 10, 21. Find value of r_1 .(xxxvi) Without using table and calculator, prove that $\cos^{-1} \frac{12}{13} = \sin^{-1} \frac{5}{13}$ (xxxvii) Solve $\sin x \cos x = \frac{\sqrt{3}}{4}$ when $x \in [0, 2\pi]$

SECTION - II

Note : Attempt any THREE questions.

3. (a) Determine whether the statement $[(p \rightarrow q) \wedge p] \rightarrow q$ is a tautology or not. 5(b) Solve the equation $(x+1)(2x+3)(2x+5)(x+3) = 945$ 5

4. (a) Use Cramer's rule to solve the system 5

$$3x_1 + x_2 - x_3 = -4$$

$$x_1 + x_2 - 2x_3 = -4$$

$$-x_1 + 2x_2 - x_3 = 1$$

(b) Prove that : ${}^nC_r + {}^nC_{r-1} = {}^{n-1}C_r$ 55. (a) If the H.M. and A.M. between two numbers are 4 and $\frac{9}{2}$ respectively find the numbers? 5(b) Use mathematical induction, to prove $1 + 2 + 4 + \dots + 2^{n-1} = 2^n - 1$ 56. (a) Prove that $\sin^6\theta + \cos^6\theta = 1 - 3\sin^2\theta \cos^2\theta$ 5(b) Prove that $\frac{\sin\alpha - \sin\beta}{\sin\alpha + \sin\beta} = \tan \frac{\alpha - \beta}{2} \cot \frac{\alpha + \beta}{2}$ 57. (a) Prove that $abc(\sin\alpha + \sin\beta + \sin\gamma) = 4\Delta S$ 5(b) Prove that $2 \tan^{-1} \frac{1}{3} + \tan^{-1} \frac{1}{7} = \frac{\pi}{4}$ 5