

Note: There are three sections in this paper i.e. A, B & C.

VERSION: A

Instructions:

- Please attempt Section-A on the MCQs Answer Sheet only.
- Only black ball point or marker may be used for shading the relevant circle.
- Please make sure that there is no cutting, over writing, erasing, or multiple circles shading.

Time Allowed: 20 Minutes

"Section - A"

Marks: 20

Q.1. Choose the correct option i.e. A, B, C or D.

- The simplest form of $i^{-1}i^2$ is _____
 (A) 1 (B) -1 (C) -i (D) i
- A square matrix $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ is _____ matrix.
 (A) Diagonal Matrix (B) Scalar Matrix (C) Unit Matrix (D) Null Matrix
- If $A = \begin{bmatrix} 1 & 3 & 1 \\ -1 & 2 & 2 \\ 2 & 0 & 2 \end{bmatrix}$, then A_{31} = _____
 (A) -4 (B) -2 (C) 4 (D) 0
- If $D = \begin{bmatrix} 5 & 5 & 7 \\ 3 & 3 & 8 \\ 1 & 1 & 2 \end{bmatrix}$, then $|D|$ = _____
 (A) 0 (B) 22 (C) -5 (D) 1
- For what value of t vectors $2t - j + 2k$ and $3i + tj$ are orthogonal.
 (A) $t = 0$ (B) $t = 6$ (C) $t = -6$ (D) $t = 1$
- If $\vec{u}$ and $\vec{v}$ are two non zero vectors the $[\vec{u} \times \vec{v}] =$ _____
 (A) $|\vec{v}| \sin \theta$ (B) $|\vec{u}| |\vec{v}| \sin \theta$ (C) $|\vec{u}| |\vec{v}| \cos \theta$ (D) $|\vec{u}| - |\vec{v}| \sin \theta$
- The geometric mean between a and b if $a < 0$ and $b < 0$ is _____
 (A) $+\sqrt{ab}$ (B) $-\sqrt{ab}$ (C) $\pm\sqrt{ab}$ (D) Does not exist
- $1 + 2 + 3 + \dots + (n+2) =$ _____
 (A) $\frac{n(n+1)}{2}$ (B) $\frac{(n+2)(n+3)}{2}$ (C) $\frac{(n+1)(n+2)}{2}$ (D) $\frac{n(2n+1)}{2}$
- $\frac{100!}{99!}$
 (A) 990 (B) 100 (C) 9900 (D) 99
- Events of the form $\{s\}$ is called _____
 (A) Simple event (B) Equally likely event (C) Compound (D) Mutually exclusive
- The middle term in the expansion of $(a+b)^{20}$ is _____ term.
 (A) 14th (B) 13th (C) 12th (D) 11th
- Expansion of $(1+3x)^{-\frac{1}{2}}$ is valid only if _____
 (A) $|x| > \frac{1}{3}$ (B) $|x| < \frac{1}{3}$ (C) $x < \frac{1}{3}$ (D) $|x| = \frac{1}{3}$
- In a function $f: X \rightarrow Y$ then the set is called _____ of the function
 (A) Domain (B) Range (C) Codomain (D) Codomain and Range
- If $f(x) = \frac{2x}{x-3}$ then the range of $f^{-1}(x)$ is _____
 (A) All real numbers (B) $R - \{3\}$ (C) $R - \{2\}$ (D) $R - \{1\}$
- If we have $x < 0$, then solution region is _____ quadrants.
 (A) 1st and 4th (B) 1st and 2nd (C) 2nd and 3rd (D) 3rd and 4th
- The angle which are connected with basic angles of measure θ by a right angle or its multiples are called. _____
 (A) Double angles (B) Half angles (C) Allied angles (D) Right angles
- The product $2 \cos 6\theta \sin 3\theta$ as Sum/ difference is. _____
 (A) $\sin 9\theta + \cos 3\theta$ (B) $\sin 9\theta + \sin 3\theta$ (C) $\sin 9\theta - \sin 3\theta$ (D) $\sin 9\theta - \cos 3\theta$
- Circumcircle is a circle that passes through _____ of triangle Mqrc-12168
 (A) Vertices (B) Sides (C) Centers (D) Bisectors
- The function $f(x) = \frac{1}{2} - x$ is _____ function.
 (A) Even (B) Odd (C) Neither even nor odd (D) Periodic
- The property $\cos(-\theta) = -\cos \theta$ is called _____ property.
 (A) Odd (B) Even (C) Translation (D) Periodic

Time Allowed: 2.40 Hours"Section – B"Marks: 50**Q-2. Attempt any ten (10) parts each part carries equal marks:-**(i) Factorize the polynomial into linear factors $P(z) = z^2 + 7zi - 10$ (ii) Prove that $\begin{vmatrix} 1 & 1 & 1 \\ a & \beta & \gamma \\ a^3 & \beta^3 & \gamma^3 \end{vmatrix} = (a - \beta)(\beta - \gamma)(\gamma - a)(a + \beta + \gamma)$ (iii) Reduce $A = \begin{bmatrix} 3 & 0 & 6 \\ 2 & 1 & 8 \\ -2 & 4 & 2 \end{bmatrix}$ to reduced echelon form.(iv) Find the vector $\vec{r}$ whose magnitude is 10 and is in the direction of $\vec{v} = 2\hat{i} - 5\hat{j} + 3\hat{k}$.(v) Find the projection of $\vec{r} = 2\hat{i} + \hat{j} + \hat{k}$ on $\vec{s} = 3\hat{i} + 3\hat{j} - \hat{k}$.(vi) If $v = \frac{u}{4} + \frac{u^2}{4^2} + \frac{u^3}{4^3} + \dots$ where $0 < u < 4$ then show that $u = \frac{4v}{1+v}$ (vii) Find the sum to n terms of the series $1 + 2t + 3t^2 + 4t^3 + \dots$ (viii) Find the value of n if ${}^n p_5 = 8 {}^n p_4$. Mqrc-12168(ix) Find the coefficient of $\frac{1}{x^5}$ in $(2 - \frac{1}{x})^8$ (x) Find the point of intersection graphically of the functions $f(x) = 3x + 6$ and $f(x) = -x - 2$.(xi) Prove that $\frac{\sin 8\beta - \sin 6\beta}{\cos 8\beta - \cos 6\beta} = -\cot 7\beta$ (xii) Prove that $\sqrt{r_1 r_2 + r_2 r_3 + r_3 r_1} = s$ (xiii) Draw the graph of the function $y = 2 \cos 2x$ in the interval $0 \leq x \leq \pi$."Section – C"Marks: 30**Note: Attempt any three (3) questions. Each question carries equal marks:-**Q-3. (a) If $z = -8 - 6i$, then show that $|z| = |-z| = |\bar{z}| = |-\bar{z}|$.

(b) Solve the following system of equations by Cramer's rule.

$$u - v + 2w = 10$$

$$3u + v + w = 7$$

$$2u + v - 2w = -4$$

Q-4. (a) Verify that the triple product of $2\hat{i} - 2\hat{j}$, $2\hat{j} - 2\hat{k}$ and $2\hat{k} - 2\hat{i}$.(b) If $a_6 + a_4 = 24$ and $a_6 - a_4 = 12$, find the arithmetic sequence.

Q-5. (a) If a pair of dice is thrown. Find the probability that the sum of digits is neither 3 nor 5.

(b) Maximize $z = 2x + 2y$ subject to $x + y \leq 4$, $x + y \geq 4$, $x \geq 0$, $y \geq 0$.

Q-6. (a) Solve a triangle ABC having sides 10, 14 and 12 respectively and find the smallest measure of angle in it. Mqrc-12168

(b) Solve $\sin^{-1} x = \cos^{-1} 2x$ for x .