ZIAUDDIN UNIVERSITY EXAMINATION BOARD

Total Time 3 hours

Total Marks: 100

Class: XI **HIGHER SECONDARY SCHOOL CERTIFICATE EXAMINATION 2024**

Time Allowed: 25 minutes **SUBJECT: MATHEMATICS MODEL PAPER**

Q1: **SECTION "A"** **Marks: 20**

Note: Attempt all questions from this section. Each question carries **one** mark.

i) If Z = (0, 2) then $|Z|$=? where 'Z' is a complex number

(a) 2 (b)-2 (c) 4 (d) $\sqrt{2}$

ii) Two matrices are conformable for addition & subtraction if their order is:

(a) Same (b) Opposite (c) Different (d) None

iii) Each diagonal element of main diagonal of a skew Hermitian matrix must be

(a) 1 (b) 0 (c) Any non-zero number (d) Any complex number

iv) If $|\vec{a} X \vec{b}|=\vec{a}.\vec{b}$, then angle between $\vec{a}$ and $\vec{b}$:

(a) 0 (b) $\frac{\pi}{2}$ (c) $\frac{\pi}{4}$ (d) π

v) If d = -3 and last term of A.P is 48, then 3rd last term is:

(a) 54 (b) 45 (c) 42 (d) 51

vi) Sum of terms of the series 1+2+3+…+15is:

(a) 100 (b) 110 (c) 120 (d) 130

vii) If a_{n-2}=3n-11, then a_n

(a) 3n+5 (b) 3n-5 (c) $3n-9$ (d) 3n-13

viii) If ${}^{10}C_r = {}^{10}C_{r+4}$, then ${}^{5}P_r$ is:

(a) 120 (b) 60 (c) 20 (d) 80

ix) If A is any event in the sample space S then correct relation is:

(a) $-1 \le P(A) \le 1$ (b) $0 \le P(A) < 1$ (c) $0 \le P(A) \le 1$ (d) None

x) The expansion of $(1-2x)^{-2}$is valid if :

(a) $|x| < 0$ (b) $|x| < \frac{1}{2}$ (c) $|x| < 2$ (d) $|x| < 1$

xi) how many number of terms are in the expension $(a+b)^n$

(a) n-1 (b) n (c) n+1 (d) n-2

xii) The domain of the function $g(x) = \frac{x+3}{x-5}$is

(a) ℝ (b) R-{3} (c) R-{5} (d) R-{-5}

xiii) If $f(x) = x+3$ then $f^{-1}(2)$ is:

(a) 0 (b)1 (c) -1 (d) 2

xiv) The feasible solution, which maximizes or minimizes the objective function is called the:

(a) Optimal solution (b) Corner solution (c) initial solution (d) complex solution

xv) Solution space of linear inequality $2x + 3y \le 6$,$\forall x, y \in \mathbb{R}$ includes all points

(a) Above the line (b) below the line (c) on and above the line (d) on and below the line

xvi) If α, β and γ are the angles of triangle ABC, then $\sin(270-\gamma)$ Is equal to :

(a) $\sin\gamma$ (b) -$\sin\gamma$ (c) $\cos\gamma$ (d)) $-\cos\gamma$

xvii) The point of intersection of the right bisectors of the sides of a triangle is called :

(a) Circum-centre (b) In-centre (c)Escribed centre (d) orthocentre

xviii) In any triangle ABC, with usual notations, abc =

(a) R (b) RS (c) 4RΔ (d) $\frac{\Delta}{s}$

xix) If $\tan 2x = -1$,then solution in the interval $[-\frac{\pi}{2}, \frac{\pi}{2}]$ is:

(a) $-\frac{\pi}{8}$ (b) $-\frac{\pi}{4}$ (c) $\frac{3\pi}{8}$ (d) $\frac{3\pi}{4}$

xx) Sin [$\text{Sin}^{-1}(\frac{1}{2})$] = ?

(a) 1 (b) $\frac{\sqrt{3}}{2}$ (c) $\frac{1}{2}$ (d) $\frac{2}{\sqrt{3}}$

END OF SECTION A

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Time: 2 hours 40 minutes **SUBJECT: MATHEMATICS SECTION "B" AND SECTION "C"** **Total Marks 80**

SECTION "B" SHORT ANSWER QUESTIONS **Marks 40**

Note: Attempt any **ten** questions from this section. Each questions carry **four** marks.

Q2. i) Solve the complex equation: $(x+3i)^2 = 2yi$

OR

Separate real and imaginary parts: $\frac{1+i}{1-i} \cdot \frac{2-i}{1-i}$

ii) Show that matrix $\begin{bmatrix} 1 & -2 & -6 \\ -3 & 2 & 9 \\ 2 & 0 & -3 \end{bmatrix}$is periodic matrix of period 2.

OR

Using definition of involutory matrix show, that matrix $\begin{bmatrix} 0 & 1 & -1 \\ 4 & -3 & 4 \\ 3 & -3 & 4 \end{bmatrix}$is involutory.

iii) Using properties of determinant prove that:

$$\begin{vmatrix} \alpha & \beta\gamma & \alpha\beta\gamma \\ \beta & \gamma\alpha & \alpha\beta\gamma \\ \gamma & \alpha\beta & \alpha\beta\gamma \end{vmatrix} = \begin{vmatrix} \alpha & \alpha^2 & \alpha^3 \\ \beta & \beta^2 & \beta^3 \\ \gamma & \gamma^2 & \gamma^3 \end{vmatrix}$$

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iv) Find the work done by a force $\vec{F} = 7\hat{i} + 9\hat{j} - 11\hat{k}$ in moving an object along a straight line from (4, 2, 7) to (6, 4, 9).

v) *Find n so that* $\frac{a^{n-5}+b^{n-5}}{a^{n-6}+b^{n-6}}$ may become G.M between a & b

OR

Convert the recurring decimal $1.1\dot{4}\dot{8}$ into an equivalent fraction.

vi) Find the sum of the series 3+6+15+42+123+$\cdots\cdots$ to n terms

OR

$\mathbf{2^2 + 4^2 + 6^2 + 8^2 + \cdots}$ ***up to n terms***

vii) *Find the value of* n & r *, when*

$n-1_{C_{r-1}} : n_{C_r} : n+1_{C_{r+1}} = 3:6:11$

OR

There are 11 men and 9 women members of a club. How many committees of 8 members can be formed , having:
(i) Exactly five men (ii) at most five women (iii) at least five women

viii) The path of two aero planes A and B in the plane are determined by the straight lines $2x - y = 6$ and $3x + y = 4$ respectively . Graphically find the point where the two paths cross each other.

ix) Prove by Mathematical Induction

$2 + 6 + 12 + \cdots + n(n+1) = \frac{1}{3}n(n+1)(n+2)$

OR

Show that $3^{2n+2} - 8n - 9$ is divisible by 64, $\forall\ n \in N$.

x) Solve the following linear programming problems by graphical method when $x \geq 0, y \geq 0$

Maximize objective function Z(x, y)= $10x$+11y

Subject to the constraints 2x+3y$\leq$ 8 ; 6x+3y$\leq$ 10

OR

Find the feasible region graphically subject to the following constraints and find its corner points

$4x + y \geq 9; 2x + 3y \leq 14$; $x - y \leq 5$; $x \geq 0$, $y \geq 0$

xi) Prove any two of the following:

(a) $\cos(\alpha+\beta)\cos(\alpha-\beta) = \cos^2\alpha - \sin^2\beta$ (b) $\cos 4\theta = 8\cos^4\theta - 8\cos^2\theta + 1$

(c) $\tan\frac{\alpha}{2}$ =cosec$\alpha - cot\alpha$ (d) $\frac{\sqrt{3}\,cos3° - sin3°}{cos3° + \sqrt{3}sin3°}$ =tan57°

xii) For an equilateral triangle ABC prove that $r : R : r_1$=1:2:3, where notations have their usual meanings.

xiii) Solve the equation sin$x - \frac{2x}{\pi}$ = 0 graphically for the interval $-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$

OR

Draw the graph of $y = cos2x$, $0 \leq x \leq 2\pi$

xiv) Show that:

$\text{Cot}^{-1}\frac{4}{\sqrt{65}} = \text{Cos}^{-1}\frac{4}{9}$ OR $2\text{Tan}^{-1}\frac{1}{3} + \text{Tan}^{-1}\frac{1}{7} = \frac{\pi}{4}$

SECTION "C" DETAILED ANSWER QUESTIONS **40 Marks**

Note: Attempt any **five** questions from this section. Each question carries **eight** marks.

Q3. Solve the non-homogeneous system of linear equations using Gauss –Jordan method.

$$2x + 2y - z = 4$$
$$x - 2y + z = 2$$
$$x + y = 0$$

Q4 Using vector algebra, find the volume of the tetrahedron having vertices A(2,1,8) , B(3,2,9) , C(2,1,4) and D (3,3,10).

Q5. A pair of fair dice is thrown. If the two numbers appearing are different, find probability, that
(i) The sum is 10,
(ii) The sum is six or less.

OR

A bag contains 15 black, 25 red and 10 white balls. A ball is drawn at random. Find the probability that is it either red or white.

Q6. If $\frac{1}{x} = \frac{2}{5} + \frac{1.3}{2!}\left(\frac{2}{5}\right)^2 + \frac{1.3.5}{3!}\left(\frac{2}{5}\right)^3 + \cdots\cdots\cdots$, then using binomial theorem show that $4x^2$-$2x - 1 = 0$

Q7. Find the point of intersection of the following functions graphically:

$f(x) = x = 2$ *and* $g(x) = x^2 - 4x + 6$

OR

Find the equation of the function of the type y= $f(x) = ax^2 + bx + c$ which cuts the x-axis at the points (-4,0) and (3,0) and passes through the points (2,-4)

Q8. Derive the Cosine Law, $a^2 = b^2 + c^2 - 2bc\cos\alpha$ for a triangle ABC.

Q9. Find general solution of $3tan^2x + 2\sqrt{3}\ tanx$ +1=0 **OR** $4cos^2x - 8sinx$ +1=0

END OF PAPER