

INTERMEDIATE EXAMINATION – 2023 (ANNUAL)
MATHEMATICS PAPER – 1 (MODEL QUESTION PAPER)

Maximum Marks: 20

Note: (i). This section consists of 20 part questions and all are to be answered. Each question carries one mark.
(ii). Do not copy the part questions in your answer-book. Fill the circle of correct option.
(iii). The use of calculator is allowed. All notations are used in their usual meanings.

$$* \frac{\pi}{4} \quad * \frac{3\pi}{4} \quad * \frac{5\pi}{4} \quad * \frac{7\pi}{4}$$

SECTION – B

(Short-Answer Questions – Marks 50)

Note: Attempt any TEN part questions from this section, selecting at least THREE part questions from each question. You may choose the tenth part question from any one sub-section. All questions carry equation marks.

COMPLEX NUMBER, MATRIX AND DETERMINANT, VECTORS AND FUNCTION & GRAPHS

- Q. 2. i). Solve the quadratic equation $z^2 - 6z = -13$ by completing the squares, where z is a complex number.
- ii). Find the period of the following period matrix.
- $$\begin{bmatrix} 1 & -2 & -6 \\ -3 & 2 & 9 \\ 2 & 0 & -3 \end{bmatrix}$$
- iii). Without expanding determinants, prove that.
- $$\begin{vmatrix} \alpha & \beta\gamma & \alpha\beta\gamma \\ \beta & \gamma\alpha & \alpha\beta\gamma \\ \gamma & \alpha\beta & \alpha\beta\gamma \end{vmatrix} = \begin{vmatrix} \alpha & \alpha^2 & \alpha^3 \\ \beta & \beta^2 & \beta^3 \\ \gamma & \gamma^2 & \gamma^3 \end{vmatrix}$$
- iv). A force of $22N$ is applied to the end of 0.15 meter wrench at an angle of 75 degrees with the axis of rotation. Calculate the magnitude of the moment $\vec{M}_o$ produced by applied force.
- v). Find the point of intersection of the following function graphically.
- $$f(x) = x + 2 \quad \text{and} \quad g(x) = x^2 - 4x + 6$$

SEQUENCE & SERIES, PROBABILITY, MATHEMATICAL INDUCTION & BINOMIAL THEOREM

- Q. 3. i). If the p th term of an H. P. is q , the q th term is p ; prove that the $(p + q)$ th term is $\frac{pq}{(p+q)}$.
- ii). Find the sum of the following series. $3 + 6 + 21 + 96 + 471 + \dots$ to n terms
- iii). How many words can be formed by 3 vowels and 4 consonants out of 5 vowels and 7 consonants.
- iv). If the probability of solving a problem by two students Ahsan and Umar are $\frac{1}{2}$ and $\frac{1}{3}$ respectively then what is the probability of the problem to be solved.
- v). Prove the following statemen by mathematical induction. $7^n - 4^n$ is divisible by 3.

LINEAR PROGRAMING AND TRIGONOMETRY

- Q. 4. i). Solve the following LP programming problems by graphical method when $x \geq 0, y \geq 0$.
Maximize the objective function $z = f(x, y) = 10x + 11y$,
Subject to the constraints $2x + 3y \leq 8$; $6x + 3y \leq 10$.
- ii). Express $4 \sin \theta + 3 \cos \theta$ in the form $r \sin(\theta + \varphi)$, where θ and φ are in first quadrant.
- iii). Prove that. (a). $\sin 3\theta = 3 \sin \theta - 4 \sin^3 \theta$
(b). $\frac{\sin 6\theta + \sin 4\theta}{\cos 6\theta + \cos 4\theta} = \tan 5\theta$
- iv). The area of triangle is 3.346 square unit. If $\beta = 20.9^\circ$, $\gamma = 117.2^\circ$. Find a and angle α .
- v). Solve the equation $\cos \theta - \theta = 0$, graphically for the interval $-\frac{\pi}{2} \leq \theta \leq \frac{\pi}{2}$.

SECTION – C
(Detailed-Answer Questions – Marks 30)

Note: Attempt any TWO questions. All questions carry equal marks.

- Q. 5. a). Solve the non-homogeneous system of linear equations using Gauss Jordan method.
 $2x + 2y - z = 4$ $x - 2y + z = 2$ $x + y = 0$ (Marks 08)
- b). Find the volume of the tetrahedron whose vertices are $A(2, 1, 8)$, $B(3, 2, 9)$, $C(2, 1, 4)$, and $D(3, 3, 10)$. (Marks 07)
- Q. 6. a). If $x = \frac{1}{3} + \frac{1.3}{3.6} + \frac{1.3.6}{3.6.9} + \frac{1.3.6.9}{3.6.9.12} + \dots$, prove that $x^2 + 2x - 2 = 0$. (Marks 08)
- b). The starting salary of a peon was Rs.8000/= and after each subsequent year his salary was increased by 15%. What total amount of salary he got for the first twelve years? (Marks 07)
- Q. 7. a). Find and verify the general solution of the following trigonometric equation. (Marks 08)
 $3 \tan^2 x + 2\sqrt{3} \tan x = -1$
- b). The sides of a parallelogram are 25cm and 35cm long and one of its angles is 36° . Find the lengths of its diagonals. (Marks 07)

Good Luck

Result.pk
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