GUIDELINES

(By Sunny Sir & group of ICSE and CBSE school teachers)

MATHAMETICES, Class - XII
MOCK PAPER – 1 (2024)

Time: 3 hours   **Total Marks: 80**

General Instructions:

1. *Candidates are allowed **additional 15 minutes** for only reading the paper. They must **NOT** start writing during this time.*
2. *This Question Paper consists of three sections A, B and C.*
3. *Candidates are required to attempt all questions from Section A and all questions **EITHER** from Section B OR Section C. **Section A**: Internal choice has been provided in two questions of two marks each, two questions of four marks each and two questions of six marks each.*
4. ***Section B***: *Internal choice has been provided in one question of two marks and one question of four marks.*
5. ***Section C***: *Internal choice has been provided in one question of two marks and one question of four marks.*
6. *All working, including rough work, should be done on the same sheet as, and adjacent to the rest of the answer. The intended marks for questions or parts of questions are given in brackets []. **Mathematical tables and graph papers are provided**.*

Section A

[20 Marks]

*(Attempt **all** questions from this Section)*

Question 1

In subparts (i) to (x) choose the correct options and in subparts (xi) to (xv), answer the questions as instructed.

(i) The value of $\begin{vmatrix} sin\theta & cos\theta \\ -cos\theta & sin\theta \end{vmatrix}$ is

    (a) 1   (b) -1   (c) 0   (d) None of these

(ii) If A=$\begin{bmatrix} 2 & -2 \\ 0 & 3 \end{bmatrix}$ and B =$\begin{bmatrix} 3 & 2 \\ 1 & -4 \end{bmatrix}$. then the sum of the matrices A and B is

    (a) $\begin{bmatrix} 5 & 0 \\ 0 & -1 \end{bmatrix}$ (b) $\begin{bmatrix} 5 & 1 \\ 0 & -1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & -1 \\ 5 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} -1 & 1 \\ 0 & 5 \end{bmatrix}$

(iii) If P(A) = $\frac{3}{10}$, P(B) = $\frac{2}{5}$ and P(A∪B) = $\frac{3}{5}$, then P(B/A)+P(A/B) is equal to

    (a) $\frac{1}{4}$ (b) $\frac{1}{3}$ (c) $\frac{5}{12}$ (d) $\frac{7}{12}$

(iv) $I = \int_{-1}^{1} x^5 dx$ is equal to

    (a) $\frac{1}{6}$ (b) 0   (c) $\frac{2}{5}$ (d) $\frac{1}{3}$

(v) The function given by $f(x) = 3 - 7x$ is strictly decreasing on R.

    (a) True   (b) False   (c) Can't say   (d) Partially true

Section B

(*Attempt **all** questions from this Section*)

Question 2

In subparts (i) and (ii) choose the correct options and in subparts (iii) to (v), answer the questions as instructed.

(i) The unit vector normal to the plane $x + 2y + 3z - 6 = 0$ is

(a) $\frac{1}{\sqrt{14}}(\hat{i} + 2\hat{j} - 3\hat{k})$ (b) $\frac{1}{\sqrt{14}}(\hat{i} + 2\hat{j} + 3\hat{k})$ (c) $\frac{1}{\sqrt{14}}(-\hat{i} + \hat{j} + \hat{k})$ (d) None of these

(ii) If the vector $\vec{b}$ is collinear with the vector $\vec{a} = (2\sqrt{2}, -1, 4)$ and $|\vec{b}|$ = 10, then

(a) $\vec{a} \pm \vec{b} = 0$ (b) $\vec{a} \pm 2\vec{b} = 0$ (c) $2\vec{a} \pm \vec{b} = 0$ (d) None of these

(iii) If A, B and C are the vertices of a ΔABC, then what is the value of $\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CA}$?

(iv) If $\vec{a}$ and $\vec{b}$ are two vectors, such that $|\vec{a} \cdot \vec{b}| = |\vec{a} \times \vec{b}|$, then find the angle between $\vec{a}$ and $\vec{b}$.

(v) Find the vector equation of the line passing through the point $A(1, 2, -1)$ and parallel to the line $5x - 25 = 14 - 7y = 35z$.

Question 3

(i) If $\vec{a} = 3\hat{i} + 5\hat{j} - 2\hat{k}$ and $\vec{b} = 2\hat{i} + \hat{j} + 3\hat{k}$, then find $|\vec{a} \times \vec{b}|$,

Or,

(ii) In any ΔABC. prove by vector method that $cosA = \frac{b^2 + c^2 - a^2}{2bc}$.

Question 4

(i) A variable plane which remains at a constant distance p from the origin cuts the coordinate axes at A, B and C. Show that the locus of the centroid of $\Delta ABC = \frac{1}{x^2} + \frac{1}{y^2} + \frac{1}{z^2} = \frac{9}{p^2}$

Or,

(ii) Find the point on the line $\frac{x+2}{3} = \frac{y+1}{3} + \frac{z-3}{3}$ at a distance of 5 units from the point $P(1, 3, 3)$.

Question 5

Draw a rough sketch and find the area enclosed by the parabola $y^2 = x$ and the line $y + x = 6$.

Section C

(*Attempt **all** questions from this Section*)

Question 6

In subparts (i) and (ii) choose the correct options and in subparts (iii) to (v), answer the questions as instructed.

(i) A profit-making company wants to launch a new product. It observes that the fixed cost of the new product is ₹35000 and the variable cost per unit is ₹500. The revenue received on the sale of x units is given by $5000x - 100x^2$, then the profit function is

(a) p(x)=4500x-100x^2-35000

(b) p(x)=45000x-100

(c) p(x)=4500x-3500x²+100

(d) p(x)=4500x-100x^2

(ii) If the lines of regression are parallel to coordinate axes, then the coefficient of correlation is

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

(iii) If the regression coefficient of y on x is 1.8 and that of x on y is 0.8, then check the statement is true or false and also give the reason.

(iv) A company produces a commodity with ₹22000 as fixed cost. The variable cost, estimated to be 20% of the total revenue received on selling the product, at the rate of ₹10 per unit. Find the break-even point.

(v) For manufacturing a certain item, the fixed cost is ₹5000 and the cost of producing each unit is ₹30. What is the total cost and average cost of producing 10 units?

Question 7

(i) For the demand function x=$\frac{b-p}{a}$, where x denotes the number of units sold at the price p per unit. Find the,

(a) slopes of average revenue curve and marginal revenue curve.

(b) relationship between slopes of average revenue curve and marginal revenue curve.

Or,

(ii) The cost function of a firm is given by $C(x) = 4x - 2x + 6$. Find the,

(a) Average cost function

(b) Marginal cost function

Question 8

Find the equation of the regression line of y on x, if the observations (x_i,y_i) are the following
(1, 4), (2, 8), (3, 2), (4, 12), (5, 10), (6, 14), (7, 16), (8, 6), (9, 18).
Draw the regression line of y on x.

Question 9

(i) Solve minimum value of $Z = x + y$ graphically under the following constraints
$3x + 2y \geq 12, x + 3y \geq 11 \text{ and } x \geq 0, y \geq 0$

Or,

(ii) A manufacturer makes two products A and B. Product A sells at ₹200 each and takes 1/2 h to make. Product B sells at ₹300 each and takes 1 h to make. There is a permanent order for 14 units of product A and 16 units of product B. A working week consists of 40 h of production and the weekly turnover must not be less than ₹10000. If the profit on each of product A is ₹20 and on product B is ₹30, then how many of each should be produced so that the profit is maximum? Also, find the maximum profit.