# SAMPLE PAPER TEST - 01 (2020-21)

**SUBJECT: MATHEMATICS** — **MAX. MARKS : 80**

**CLASS : XII** — **DURATION : 3 HRS**

**General Instruction:**

1. This question paper contains two **parts A and B**. Each part is compulsory. Part A carries **24** marks and Part B carries **56** marks
2. **Part-A** has Objective Type Questions and **Part -B** has Descriptive Type Questions
3. Both Part A and Part B have choices.

**Part – A:**

1. It consists of two sections- **I and II**.
2. Section **I** comprises of 16 very short answer type questions.
3. Section **II** contains **2** case studies. Each case study comprises of 5 case-based MCQs. An examinee is to attempt **any 4 out of 5 MCQs**.

**Part – B:**

1. It consists of three sections- **III, IV and V.**
2. Section **III** comprises of 10 questions of **2 marks** each.
3. Section **IV** comprises of 7 questions of **3 marks** each.
4. Section **V** comprises of 3 questions of **5 marks** each.

## PART - A
## SECTION-I
**Questions 1 to 16 carry 1 mark each.**

**1.** Show that $f(x) = x^2 + 2$ is not injective.

**2.** For any matrix $A = [a_{ij}]$, if $c_{ij}$ denotes its cofactors then find the value of $a_{11}c_{12} + a_{12}c_{22} + a_{13}c_{32}$.

**3.** Find the principal value of $\sec^{-1}(-\sqrt{2}) + \cos ec^{-1}(-\sqrt{2})$

**4.** Check whether the relation R defined on the set A = {1, 2, 3, 4, 5, 6} as R = {(a, b): b= a + 1} is reflexive.

**5.** If $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$ be such that $A^{-1} = kA$, then find the value of k.

**6.** If A is a matrix of order 3 x 3 such that |A| = 5, find |A(adjA)|.

**7.** Find the degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^2 + \left(\frac{dy}{dx}\right)^2 = x\sin\frac{dy}{dx}$.

**8.** Evaluate: $\int \sin^2 \frac{x}{2}\, dx$

**9.** Evaluate: $\int_0^2 e^{[x]} dx$

**10.** If A and B are two independent events with P(A) = 3/5 and P(B) = 4/9, then find $P(\overline{A} \cap \overline{B})$.

**11.** If $E_1$ and $E_2$ are two independent events such that $P(E_1) = 0.35$ and $P(E_1 \cup E_2) = 0.60$, then find $P(E_2)$.

**12.** If the angle between the vectors $\hat{i}+\hat{k}$ and $\hat{i}-\hat{j}+\alpha\hat{k}$ is $\frac{\pi}{2}$, then find the value of $\alpha$.

**13.** If $\vec{a} = (\hat{i}+3\hat{j}-2\hat{k})\times(-\hat{i}+3\hat{k})$, then find the value of $|\vec{a}|$.

**14.** If $|\vec{a}| = 2$, $|\vec{b}| = 3$ and $\vec{a}.\vec{b} = 3$, then find projection of $\vec{b}$ on $\vec{a}$.

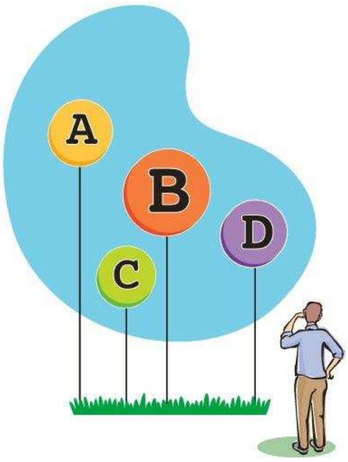
**15.** Find the projection of the vector $7\hat{i}+\hat{j}-4\hat{k}$ and $2\hat{i}+6\hat{j}+3\hat{k}$.

**16.** Find the value of $\lambda$ if the vector $2\hat{i}+\lambda\hat{j}-4\hat{k}$ and $2\hat{i}-\hat{j}+\hat{k}$ are perpendicular.

## SECTION-II

**Case study-based questions are compulsory. Attempt any four sub parts of each question. Each subpart carries 1 mark**

**17.** In a test, you either guesses or copies or knows the answer to a multiple-choice question with four choice. The probability that you make a guess is $\frac{1}{3}$, you copy the answer is $\frac{1}{6}$. The probability that your answer is correct, given that you guess it, is $\frac{1}{8}$. And also, the probability that you answer is correct, given that you copy it, is $\frac{1}{4}$.


(i) The probability that you know the answer is

(a) 0 (b) 1 (c) $\frac{1}{2}$ (d) $\frac{1}{4}$

(ii) The probability that your answer is correct given that you guess it, is

(a) $\frac{1}{2}$ (b) $\frac{1}{8}$ (c) $\frac{1}{6}$ (d) $\frac{1}{4}$

**21.** Evaluate: $\sec^{-1}\sqrt{2} + 2\operatorname{cosec}^{-1}(-\sqrt{2})$.

**22.** Evaluate: $\int \frac{dx}{9x^2 + 6x + 10}$.

**23.** If $\vec{a} \times \vec{b} = \vec{a} \times \vec{c}$, $\vec{a} \neq 0$ and $\vec{b} \neq \vec{c}$, show that $\vec{b} = \vec{c} + t\vec{a}$ for some scalar t.

**24.** A couple has two children. Find the probability that both children are males, if it is known that atleast one of the children is male.

**25.** Evaluate: $\int_0^{\pi/4} \sqrt{1 + \sin 2x}\ dx$

**26.** If $\sec\left(\frac{x+y}{x-y}\right) = a$, prove that $\frac{dy}{dx} = \frac{y}{x}$.

**27.** Show that the tangents to the curve $y = 2x^3 - 3$ at the points where $x = 2$ and $x = -2$ are parallel.

**28.** Solve: $\frac{dy}{dx} = 1 - x + y - xy$

## SECTION – IV

**Questions 29 to 35 carry 3 marks each.**

**29.** Let the function $f : R^+ \to [-9, \infty)$ given by $f(x) = 5x^2 + 6x - 9$. Prove that f is bijective.

**30.** Evaluate: $\int_3^4 \frac{\sqrt{x}}{\sqrt{x} + \sqrt{7-x}} dx$

**31.** Find the solution of differential equation $x^2 dy + y(x + y)dx = 0$, if $x = 1$ and $y = 1$.

**32.** Find the area of region bounded by lines $y = \frac{5}{2}x - 5$, $x + y - 9 = 0$ and $y = \frac{3}{4}x - \frac{3}{2}$.

**33.** Show that the triangle of maximum area that can be inscribed in a given circle is an equilateral triangle.

**34.** If $x^y - y^x = a^b$, find $\frac{dy}{dx}$.

**35.** Find whether the following function is differentiable at x = 1 and x = 2 or not.

$$f(x) = \begin{cases} x & , \ x < 1 \\ 2 - x & , 1 \le x \le 2 \\ -2 + 3x - x^2 , & x > 2 \end{cases}$$

## SECTION – V

**Questions 36 to 38 carry 5 marks each.**

**36.** Find the foot of the perpendicular drawn from the point $(-1, 3, -6)$ to the plane $2x + y - 2z + 5 = 0$. Also, find the equation and length of the perpendicular.

**37.** Solve the LPP graphically minimize, $Z = 30x - 30y + 1800$ subject to constraints $x + y \leq 30$, $x \leq 15$, $y \leq 20$, $x + y \geq 15$; $x, y \geq 0$.

**38.** If $A = \begin{bmatrix} 1 & 3 & 4 \\ 2 & 1 & 2 \\ 5 & 1 & 1 \end{bmatrix}$, then find $A^{-1}$. Using $A^{-1}$, solve the given system of linear equations:

$x + 3y + 4z = 8$, $2x + y + 2z = 5$ and $5x + y + z = 7$.