SAMPLE PAPER TEST - 02 (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. Check whether f(x) = tanx is one-one or not on R.

2. Find the domain of $f(x) = \sin^{-1}(-x^2)$.

3. If A is a matrix of order 3 x 3 such that |A| = 4, find $|A^{-1}|$.

4. Find the value of $\cot\left(\frac{\pi}{3} - 2\cot^{-1}\left(\frac{1}{\sqrt{3}}\right)\right)$

5. If for the matrix A, $A^3 = I$, then find the value of A^{-1}.

6. If 2A + B + X = 0, where $A = \begin{bmatrix} -1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -2 \\ 1 & 5 \end{bmatrix}$, then find the value of matrix X.

7. Find the equation of the tangent to the curve $y = x^2 + 4x + 1$ at the point where x = 3.

8. If $y = 7x^3 - 4x^2$, find $\frac{dy}{dx}$.

9. Evaluate: $\int \frac{dx}{x + x\log x}$

10. If A and B are events such that P(A) = 0.3, P(B) = 0.6 and P(B/A) = 0.5, find P(A/B).

11. An urn contains 10 black and 5 white balls. Two balls are drawn from the urn one after the other without replacement then find the probability that both drawn balls are black.

12. If $\vec{a} = \hat{i} + \hat{j} + 2\hat{k}$ and $\vec{b} = 3\hat{i} + 2\hat{j} - \hat{k}$, then find the value of $(\vec{a} + 3\vec{b}).(2\vec{a} - \vec{b})$.

13. Find the value of λ if the vectors $\vec{a} = 2\hat{i} - 3\hat{j} + \hat{k}$ and $\vec{b} = \hat{j} + \lambda\hat{k}$ are perpendicular.

14. Write the cartesian equation of the plane whose vector equation is $\vec{r}.(2\hat{i} - \hat{j} + \hat{k}) = 7$.

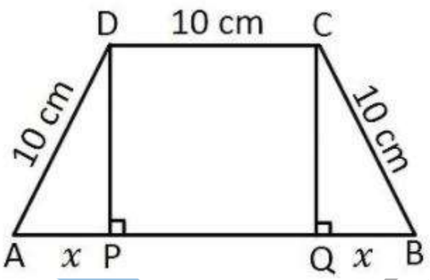
15. Write the equation of line passing through the points (–1, 2, 1) and (3, 1, 4).

16. If $|\vec{a} \times \vec{b}|^2 + (\vec{a}.\vec{b})^2 = 144$ and $|\vec{a}| = 4$, then find the value of $|\vec{b}|$.

SECTION-II

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

17. A building has front gate has the figure as shown below:
It is in the shape of trapezium whose three sides other than base in 10 m. Height of the gate is 'h' m.



On the basis of above figure answer the following questions:

(i) The relation between a and h is

(a) $x^2 + h^2 = 10$ (b) $x^2 + h^2 = 100$ (c) $h^2 - x^2 = 10$ (d) $x^2 - h^2 = 10$

(ii) The are of gate A expressed as a function of x is

(a) $(10 + x)\sqrt{100 + x^2}$ (b) $(10 - x)\sqrt{100 + x^2}$

(c) $(10 + x)\sqrt{100 - x^2}$ (d) $(10 - x)\sqrt{100 - x^2}$

(iii) The value of x when A is maximum is

(a) 5 m (b) 10 m (c) 15 m (d) 20 m

(iv) The value of h when A is maximum is

(a) $5\sqrt{2}$ m (b) $5\sqrt{3}$ m (c) $10\sqrt{2}$ m (d) $10\sqrt{3}$ m

(v) Maximum value of A is (in m^2) is

(a) $\dfrac{75\sqrt{3}}{2}$ (b) $75\sqrt{3}$ (c) $\dfrac{75\sqrt{3}}{4}$ (d) 75

18. The probability distribution functions which shows the number of hours (X) a student study during lockdown period in a day, is given by (where C > 0)

X	0	1	2
P(X)	$3C^3$	$4C - 10C^2$	$5C - 1$

On the basis of above information answer the following questions:

(i) The correct equation for C is

(a) $3C^3 - 10C^2 + C - 2 = 0$ (b) $3C^3 + 10C^2 + C - 2 = 0$

(c) $3C^3 - 10C^2 + 9C - 2 = 0$ (d) None of these

(ii) The value of C is

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{6}$

(iii) $P(X < 2) =$

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{6}$

(iv) $P(X = 1) =$

(a) $\frac{2}{9}$ (b) $\frac{1}{9}$ (c) $\frac{2}{3}$ (d) $\frac{1}{3}$

(v) $P(X \geq 0) =$

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

PART B
SECTION – III

Questions 19 to 28 carry 2 marks each.

19. An urn contains 5 white and 8 white black balls. Two successive drawing of three balls at a time are made such that the balls are not replaced before the second draw. Find the probability that the first draw gives 3 white balls and second draw gives 3 black balls.

20. Find X and Y, if $X + Y = \begin{bmatrix} 7 & 0 \\ 2 & 5 \end{bmatrix}$ and $X - Y = \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$.

21. Examine the continuity of the function: $f(x) = \begin{cases} \frac{|x-4|}{2(x-4)}, & x \neq 4 \\ 0, & x = 4 \end{cases}$ at x = 4.

22. If $y = \frac{1}{\sqrt{a^2 - x^2}}$, then find $\frac{dy}{dx}$.

23. Find the value of $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right) - 2\sec^{-1}\left(2\tan\frac{\pi}{6}\right)$.

24. Given $|\vec{a}| = 10$, $|\vec{b}| = 2$ and $\vec{a}.\vec{b} = 12$, then find $|\vec{a} \times \vec{b}|$.

25. If $x = 10(t - \sin t)$, $y = 12(1 - \cos t)$, find $\frac{dy}{dx}$.

26. Find the equation of the tangent to the curve y = $-5x^2 + 6x + 7$ at (1/2, 35/4).

27. Evaluate: $\int_0^1 \frac{\tan^{-1} x}{1+x^2} dx$

28. Two vectors $\vec{a}$ and $\vec{b}$, prove that the vector $|\vec{a}|\vec{b}+|\vec{b}|\vec{a}$ is orthogonal to the vector $|\vec{a}|\vec{b}-|\vec{b}|\vec{a}$.

SECTION – IV

Questions 29 to 35 carry 3 marks each.

29. Let the function $f: R^+ \to [4,\infty)$ given by f(x) = $x^2 + 4$. Prove that f is bijective.

30. Find the particular solution of differential equation $(3xy + y^2)dx + (x^2 + xy)dy = 0$ for x = 1 and y = 1.

31. Evaluate: $\int_0^{\pi/2} \log(\sin x) dx$

32. Find the volume of the largest cylinder that can be inscribed in sphere of radius 'r'.

33. Find the area of the region bounded by the line y = 3x + 2, the x-axis and the ordinates x = –1 and x = 1.

34. Evaluate: $\int \frac{x^2}{x\sin x + \cos x} dx$

35. Find the point on the curve $y^2 = 2x$ which is at a minimum distance from the point (1, 4).

SECTION – V

Questions 36 to 38 carry 5 marks each.

36. Solve the LPP graphically maximize, Z = 1500(7x + 6y) subject to constraints;
$x + y \le 50$; $2x + y \le 80$, x, $y \ge 0$.

37. Find the equation of plane determined by points A(3, –1, 2), B(5, 2, 4), C(–1. –1, 6) and hence find the distance between plane and point P(6, 5, 9).

38. Evaluate the product AB, where $A = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{bmatrix}$. Hence solve the system of linear equations x – y = 3, 2x + 3y + 4z = 17 and y + 2y = 7.