PRACTICE PAPER – II

SUB:- MATHEMATICS

CLASS - XII

Time : 3 hrs Max. Marks : 80

General Instructions

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.
5. Internal choice is provided in 3 questions of Section –III, 2 questions of Section-IV and 3 questions of Section-V. You have to attempt only one of the alternatives in all such questions.

PART A

Section I

All questions are compulsory. In case of internal choices attempt any one.

1. Find the range of $\operatorname{cosec}^{-1}x$.
2. If every element of B is the image of some element of A under f, then the function $f: A \rightarrow B$ is injective or surjective.

Or Name the relation R in a set A, if each element of A is related to every element of A, i.e. $R = A \times A$.

3. Find the value of $\sin^{-1}\left(\cos\frac{2\pi}{3}\right)$.
4. If A and B are two matrices of order $3 \times m$ and $3 \times n$ respectively and $m = n$, then find the order of $5A - 2B$ is
5. If A is symmetric, then show that $B'AB$ is symmetric matrix.
6. If A is a matrix of order 3×3 and $|A| = 10$, then find the value of $|\operatorname{adj} A|$.

* You are advised to attempt this sample paper without referring the solutions given here. However, cross check your solutions with the solutions given at the end after you completed the paper.

Or

If B is a matrix of order 3×3, then find the value of $[B B^{-1}]$.

7. Evaluate $\int x \sec x^2 \, dx$ is equal to

Or

Evaluate $\int \frac{\cos x - \sin x}{1 + 2 \sin x \cos x} dx$

8. If $x = t^2$ and $y = t^3$, find $\frac{d^2 y}{dx^2}$.

9. If $\int_0^1 (3x^2 + 2x + k)\, dx = 0$, find k.

Or

Evaluate $\int_0^2 [x]\, dx$.

10. If A and B are two mutually exclusive events, then find $P(A/B)$.

11. If $P(A / B) > P(A)$, then prove that $P(B / A) > P(B)$.

12. Find the value of projection of the line joining the points (3, 4, 5) and (4, 6, 3) on the line joining the points (−1, 2, 4) and (1, 0, 5).

13. Find the area of the parallelogram determined by the vectors $\hat{i} + 2\hat{j} + 3\hat{k}$ and $3\hat{i} - 2\hat{j} + \hat{k}$.

Or

Find the magnitude of greater diagonal of parallelogram whose sides are $\hat{i} + \hat{j} - 2\hat{k}$ and $-2\hat{i} + 3\hat{j} + 4\hat{k}$.

14. Find the value of $\hat{i} \cdot (\hat{j} \times \hat{k}) + j \cdot (\hat{i} \times \hat{k}) + \hat{k} \cdot (\hat{i} \times \hat{j})$.

15. If $\vec{a} = 4\hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = 2\hat{i} - 2\hat{j} + \hat{k}$, then find $|\vec{a} - \vec{b}|$.

16. If $\vec{a} \cdot \vec{a} = 0$ and $\vec{a} \cdot \vec{b} = 0$, then what can be concluded about the vector $\vec{b}$?

Section II

Both the Case study based questions are compulsory. Attempt any 4 sub parts from each question. Each part carries 1 mark

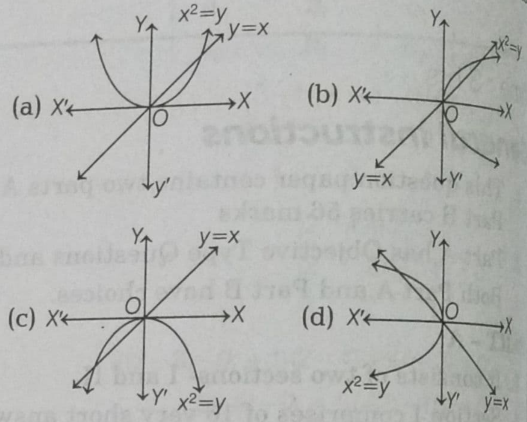
17. Consider the following equations of curve $x^2 = y$ and $y = x$.

On the basis of above information answer the following questions.

(i) The point of intersection of both the curves is

(a) (0, 0), (2, 2) (b) (0, 0), (1, 1)
(c) (0, 0), (−1, −1) (d) (0, 0), (−2, −2)

(ii) The graph of the given curves is shown as



(iii) The value of integral $\int_0^1 x \, dx$ is

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

(iv) The value of integral $\int_0^1 x^2 \, dx$ is

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

(v) The value of area bounded by the curves $x^2 = y$ and $y = x$ is (in sq unit)

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

18. Given three identical boxes I, II and III, each containing two coins. In box I both coins are gold coins, in box II both are silver coins and in box III there is one gold and one silver coin. A person choose a box at random and takes out a coin.

On the basis of above information, answer the following questions.

(i) The probability of choosing one box is

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

(ii) The probability of getting gold coin from III box is

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

(iii) The probability of choosing III box and getting gold coin is

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

(iv) Total probability of drawing gold coin is

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

(v) If drawn coin is of gold, then the probability that other coin in box is also of gold is

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

Section III

All questions are compulsory. In case of internal choices attempt any one.

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

Or Prove that the tangents to the curve $y=x^2-5x+6$ at the points (2, 0) and (3, 0) are at right angles.

20. If $\vec{a}\times\vec{b}=\vec{c}\times\vec{d}$ and $\vec{a}\times\vec{c}=\vec{b}\times\vec{d}$, show that $\vec{a}-\vec{d}$ is parallel to $\vec{b}-\vec{c}$, where $\vec{a}\neq\vec{d}$ and $\vec{b}\neq\vec{c}$.

21. A and B are two events such that $P(A)\neq 0$. Find $P(B/A)$, if

(i) A is a subset of B (ii) $A\cap B=\phi$

22. Examine the continuity of

$$f(x)=\begin{cases}\dfrac{\log x-\log 2}{x-2}, & x>2\\ \dfrac{1}{2}, & x=2\\ 2\left(\dfrac{x-2}{x^2-4}\right), & x<2\end{cases}$$ at $x=2$.

Or If $x^y=e^{x-y}$, prove that $\frac{dy}{dx}=\frac{\log x}{(1+\log x)^2}$

23. Evaluate the determinant

$$\Delta=\begin{vmatrix}\log_3 512 & \log_4 3\\ \log_3 8 & \log_4 9\end{vmatrix}.$$

24. Find two branches other than the principal value branch of $\tan^{-1}x$.

25. If $\vec{c}$ is perpendicular to $\vec{a}$ and $\vec{b}$, then prove that it is also perpendicular to $\vec{a}+\vec{b}$.

26. If $xy=1$, prove that $\frac{dy}{dx}+y^2=0$.

Or

If $y=x^{\sin x}$, find $\frac{dy}{dx}$.

27. Evaluate $\int\frac{1}{x(x^n+1)}dx$.

28. Solve $(x-1)\frac{dy}{dx}=2xy$.

Section IV

All questions are compulsory. In case of internal choices attempt any one.

29. If R_1 and R_2 be two equivalence relations on a set A, prove that $R_1\cap R_2$ is also an equivalence relation on A.

30. Evaluate $\int\frac{dx}{\sin(x-a)\cdot\cos(x-b)}$.

Or

Evaluate $\int\frac{xe^{2x}}{(1+2x)^2}dx$.

31. Evaluate $\int_0^{2\pi}\frac{x\sin^{2n}x}{\sin^{2n}x+\cos^{2n}x}dx$

Or For $x>0$, let $f(x)=\int_1^x\frac{\log_e t}{1+t}dt$. Find the function $f(x)+f\left(\frac{1}{x}\right)$ and show that $f(e)+f\left(\frac{1}{e}\right)=\frac{1}{2}$.

32. Prove that the radius of the right circular cylinder of greatest curved surface area which can be inscribed in a given cone is half of that of the cone.

33. Sketch the graph of $y=|x+3|$ and evaluate the area under the curve $y=|x+3|$ above X-axis and between $x=-6$ to $x=0$.

34. If $x=\sin\theta$, $y=\cos p\theta$, prove that $(1-x^2)y_2-xy_1+p^2y=0$.

35. Evaluate $\int\frac{x+1}{x(1+xe^x)^2}dx$.

Section V

All questions are compulsory. In case of internal choices attempt any one.

36. Find the distance of the point $P(-1, -5, -10)$ from the point of intersection of the line $\vec{r} = 2\hat{i} - \hat{j} + 2\hat{k} + \lambda(3\hat{i} + 4\hat{j} + 2\hat{k})$ and the plane $\vec{r} \cdot (\hat{i} - \hat{j} + \hat{k}) = 5$.

Or

If lines $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{4}$ and $\frac{x-3}{1} = \frac{y-k}{2} = \frac{z}{1}$ intersect, then find the value of k and hence, find the equation of the plane containing these lines.

37. Find A^{-1}, if $A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$ and show that $A^{-1} = \frac{A^2 - 3I}{2}$.

Or

If $A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$, find A^{-1} and hence solve the system of linear equation

$$x + 2y + z = 4,$$
$$-x + y + z = 0,$$
$$x - 3y + z = 2.$$

38. Solve the given LPP minimise $Z = 4x + 3y$

Subject to the constraints

$200x + 100y \geq 4000$, $x + 2y \geq 50$

$40x + 40y \geq 1400$, $x, y \geq 0$

Or

Solve the given LPP maximize $(Z) = 22x + 18y$

Subject to constraints $x + y \leq 20$

$x + 2y \leq 48$

$x \geq 0, y \geq 0$