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BOARD SAMPLE PAPER- III (2025-26)

Time : 03 : 00 Hours **CLASS :– XII-MATHS (041)** **M.M. : 80**

General Instructions:

1. This Question paper contains - five sections A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.
2. Section A has 18 MCQs and 02 Assertion-Reason based questions of 1 mark each.
3. Section B has 5 Very Short Answer (VSA)-type questions of 2 marks each.
4. Section C has 6 Short Answer (SA)-type questions of 3 marks each.
5. Section D has 4 Long Answer (LA)-type questions of 5 marks each.
6. Section E has 3 source based/case based/passage based/integrated units of assessment (4marks each) with sub parts

SECTION - A

1. The number of independent arbitrary constants in a differential equation of 3rd order are
(a) 1 (b) 2 (c) 3 (d) None of these

2. If $|\vec{a}|=8, |\vec{b}|=3$ and $|\vec{a}\times\vec{b}|=12$, then the value of $\vec{a}.\vec{b}$ is
(a) $6\sqrt{3}$ (b) $8\sqrt{3}$ (c) $12\sqrt{3}$ (d) None of these

3. If for any two events A and B, $P(A)=\frac{4}{5}$ and $P(A\cap B)=\frac{7}{10}$ then P (B/ A) is equal to :-
(a) $\frac{1}{10}$ (b) $\frac{1}{8}$ (c) $\frac{7}{8}$ (d) $\frac{17}{20}$

4. The feasible region of a linear programming problem is bounded. The corresponding objective function is Z=6x-7y.
The objective function attains ___________ in the feasible region.
(a) Only minimum (b) Only maximum
(c) Both maximum and minimum (d) Either maximum and minimum but not both

5. The domain of the function $\cos^{-1}(2x-3)$ is :
(a) (-1, 2) (b) (1, 2) (c) [-1, 1] (d) [1, 2]

6. If $A=\begin{bmatrix}2+x & 3 & 4\\ 1 & -1 & 2\\ x & 1 & -5\end{bmatrix}$ is a singular matrix, then the value of x is
(a) $\frac{13}{25}$ (b) $\frac{-25}{13}$ (c) $\frac{5}{13}$ (d) $\frac{25}{13}$

7. If A is a square matrix of order 3 such that $|A| = -5$, then $|adj.A|$ is equal to

(a) 125 (b) -25 (c) 25 (d) ± 25

8. The degree of the differntial equation

$$\frac{d^2y}{dx^2} + 3\left(\frac{dy}{dx}\right)^2 = x^2 \log\left(\frac{d^2y}{dx^2}\right) \text{is}$$

(a) 2 (b) 1 (c) Not defined (d) 3

9. If the following function f(x) is continuous at x = 0, then what is value of k? $f(x) = \begin{cases} \dfrac{\sin\frac{3x}{2}}{x}, & x \neq 0 \\ k & 0 \end{cases}$

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

10. If A = $[a_{ij}]$ is a matrix of order 2×3 such that $a_{ij} = \begin{cases} 2 & ,\text{if } i+j \text{ is even} \\ i-2j, & \text{if } i+j \text{ is odd} \end{cases}$ then matrix A is

(a) $\begin{bmatrix} 2 & 0 & 2 \\ -3 & 2 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 2 & 0 \\ 2 & -2 \\ 2 & 4 \end{bmatrix}$ (c) $\begin{bmatrix} 2 & -3 \\ 0 & 2 \\ 2 & -4 \end{bmatrix}$ (d) $\begin{bmatrix} 2 & -3 & 2 \\ 0 & 2 & -4 \end{bmatrix}$

11. Points D(0,2), E(3,1) and F(4,0) are the mid points of sides AB, BC and AC of a triangle ABC, then area of a triangle ABC is

(a) 1 sq unit (b) 2 sq unit (c) 4 sq unit (d) 8 sq unit

12. $\displaystyle\int_0^{\frac{\pi}{2}} \frac{\sin^{2024} x \, dx}{\sin^{2024} x + \cos^{2024} x} =$

(a) $\frac{\pi}{2}$ (b) π (c) $\frac{\pi}{4}$ (d) 2π

13. In a college, 25% students fail in English and 20% students fail in Hindi and 15% fail in both. One student is chosen at random. The probability that he fails in English if he fails in Hindi is

(a) $\frac{3}{10}$ (b) $\frac{2}{5}$ (c) $\frac{3}{4}$ (d) $\frac{4}{5}$

14. The difference of the order and degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^2 + \left(\frac{dy}{dx}\right)^3 + x^4 = 0$ is

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

15. The projection of $\vec{a} = 2\hat{i} + \hat{j} + \hat{k}$ along $\vec{b} = \hat{i} + 2\hat{j} + 2\hat{k}$ is

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

16. In which of these interval is the function $f(x) = x^2 - 4x$ strictly decreasing ?

(a) $(-\infty, 0)$ (b) $(0, 4)$ (c) $(2, \infty)$ (d) $(-\infty, \infty)$

17. The value of $\int_{-1}^{1} \log\left(\frac{2+x}{2-x}\right)$ is

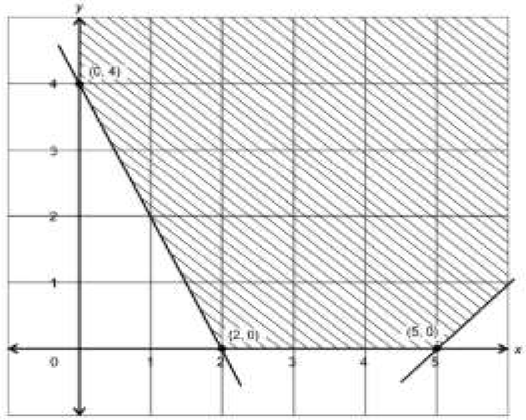
(a) 0 (b) 1 (c) 2 (d) e

18. A linear programming problem (LPP) along with the graph of its constraints is shown here. The corresponding objective function is

Minimize: Z = 3x+2y.

The minimum value of the objective function is obtained at the corner point (2, 0).

The optimal solution of the above linear programming problem ____________.



(a) Does not exist as the feasible region is unbounded.

(b) Does not exist as the inequality 3x+2y<6 does not have any point in common with the feasible region.

(c) Exists as the inequality 3x+2y>6 has infinitely many points in common with the feasible region.

(d) Exists as the inequality 3x+2y<6 does not have any point in common with the feasible region.

For questions 19 - 20

(a) Both (A) and (R) are true and (R) is the correct explanation of (A).

(b) Both (A) and (R) are true but (R) is not the correct explanation of (A).

(c) (A) is true and (R) is false.

(d) (A) is false, but (R) is true.

19. Assertion: If $y=\sin^{-1}\left(6x\sqrt{1-9x^2}\right)$, then $\frac{dy}{dx}=\frac{6}{\sqrt{1-9x^2}}$

Reason: $\sin^{-1}\left(6x\sqrt{1-9x^2}\right)=3\sin^{-1}(2x)$

20. Assertion (A): If R = {(x, y): x + 2y = 8) is a relation on Natural numbers N, then range of R is equal to {1,2,3}

Reason (R): Every relation which is symmetric and transitive is reflexive also

SECTION - B

21. Out of a group of 50 people, 20 always speak the truth. Two persons are selected at random from the group, without replacement. Find the probability distribution of selected persons who always speak the truth.

22. If $x=\sin\theta, y=\cos\theta$ find $\frac{d^2y}{dx^2}$ when $\theta=\frac{\pi}{4}$.

23. Find a and b If the function given by $f(x)=\begin{cases} ax^2+b & x<1 \\ 2x+1 & x\geq 1 \end{cases}$ is differentiable at x = 1.

24. Find $\int_2^8 \frac{\sqrt{10-x}}{\sqrt{x}+\sqrt{10-x}}dx$.

25. If $\vec{a},\vec{b},\vec{c}$ be three vectros such that $\vec{a}+\vec{b}+\vec{c}=\vec{0}$ and $|\vec{a}|=3, |\vec{b}|=4, |\vec{c}|=5,$ then find the value of $\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}$.

SECTION - C

26. If $y=e^{a\cos^{-1}x}, -1\leq x\leq 1$ then show that: $(1-x^2)\frac{d^2y}{dx^2}-x\frac{dy}{dx}-a^2y=0$

27. Find the particular solution of differential equation :

$\frac{dy}{dx}+y\cot x=2x+x^2\cot x,$ given that $y=0$ when $x=\frac{\pi}{2}$

OR

Find the particular solution of the differential equation :

$(xdy-ydx)y\sin\frac{y}{x}=(ydx+xdy)x\cos\frac{y}{x},$ given that $y=\pi$ when $x=3$

28. Solve the following LPP graphically: -

Minimize Z = 5x + 10 y

Subject to constraints $x + 2y \leq 120$

$x + y \geq 60$

$x-2y \geq 0$

$x, y \geq 0$

OR

Solve the following LPP graphically: -

Minimize Z = 6x + 3 y

Subject to constraints $3x + 2y \leq 150$

$4x + y \geq 80$

$x + 5y \geq 115$

$x, y \geq 0$

29. Evaluate: $\int_0^{\frac{\pi}{4}} \log_e(1+\tan x)dx$

30. Sand is pouring from a pipe at the rate of 12 cm^3/s. The falling sand forms a cone on the ground in such a way that the height of the cone is always one-sixth of the radius of the base. How fast is the height of the sand cone increasing when the height is 4 cm?

OR

A ladder 5 m long is leaning against a wall. The bottom of the ladder is pulled along the ground, away from the wall, at the rate of 2cm/s. How fast is its height on the wall decreasing when the foot of the ladder is 4 m away from the wall?

31. Evaluate: $\int\sqrt{\frac{x}{1-x^3}}dx; x\in(0,1)$

SECTION - D

32. The Earth has 24 times zones, defined by dividing the Earth into 24 equal longitudinal segments. These are the the regions on Earth that have the same standard time. For example, USA and India fall in different time zones, but Sri Lanka and India are in the same time zone.

A relation R is defined on the set U = {All people on the Earth} such that

R = {(x, y) : The time difference between the time zones x and y reside in is 6 hours}.

(i) Check whether the relation R is reflexive, symmetric and transitive.

(ii) Is relation R an equivalence relation ?

OR

Let $f:[1,\infty)\rightarrow[1,\infty)$ is given by $f(x)=(x^2+1)^2-1$.

Check whether the function is bijective.

33. Find the product of $\begin{bmatrix} 1 & 0 & 3 \\ -1 & 2 & -2 \\ 2 & -3 & 4 \end{bmatrix}\begin{bmatrix} -4 & 18 & 12 \\ 0 & 4 & 2 \\ 2 & -6 & -4 \end{bmatrix}$.

Hence solve the system of equations:

$x-y+2z=1, 2y-3z=1, 3x-2y+4z=2$

34. Find the area of the region bounded by the parabola $y^2 = 2x$ and the straight- line x - y = 4

35. Find the vector and Cartesian equations of the straight line passing through the point (-5, 7, -4) and in the direction of (3, -2, 1).

Also find the point where this straight line crosses the XY-plane.

OR

Given below are two lines L_1 and L_2.

L_1 : $2x=3y=-z$ and L_2 : $6x=-y=-4z$

i. Find the angle between the two lines.

ii. Find the shortest distance between the two lines.

SECTION - E

36. There are three categories of students in a class of 60 students:

A: Very hard-working students

B: Regular but not so hard working

C: Careless and irregular..

It's known that 10 students are in category A, 30 in category B and rest in category C.It is also found that probability of students of category A, unable to get good marks in the final year examination is, 0.002, of category B it is 0.02 and of category C, this probability is 0.20.

Based on the above information answer the following:

(i) Let E denote the event that the student could not get good marks in the examination then find P(E/A) & P(E/B)

(ii) If a student selected at random was found to be the one who could not get good marks in the examination, then the probability that this student is of category C.

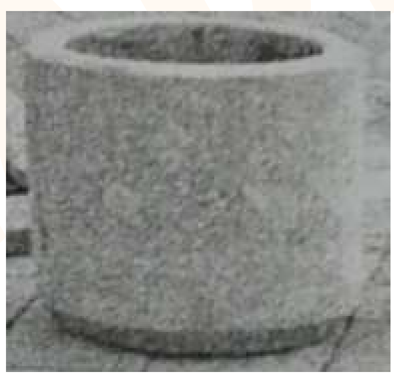
(iii) Assume that a student selected at random was found to be the one who could not get good marks in the examination. Then the probability that this student is either of category A or of category B

37. Find the vector and cartesian equations of the line pasing through the point (2, 1, 3) and perpendicular to the lines $\frac{x-1}{1}=\frac{y-2}{2}=\frac{z-3}{3}$ and $\frac{x}{-3}=\frac{y}{2}=\frac{z}{5}$.

OR

Find the foot of the perpendicular from the point (0, 2, 3) on the line $\frac{x+3}{5}=\frac{y-1}{2}=\frac{z+4}{3}$. Also, find the length of the perpendicular.

38. A cylindrical tank of fixed volume of $144\pi m^3$ is to be constructed with an open top to throw all the garbage in an orphanage. The manager of the orphanage called a contractor for the construction ensure that a tank to dispose off biodegradable waste can be constructed at a minimum cost.



(i) Find the cost of the least expensive tank that can be constructed if it costs Rs. 80 per sq. m for base and Rs 120 per sq. m for walls.

(ii) Find the radius and height as well.

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ROUGH WORK

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