

CAREERS 360

PRACTICE **Series**

Karnataka II PUC

Mathematics

Official Model Question Paper 2025



GOVERNMENT OF KARNATAKA
KARNATAKA SCHOOL EXAMINATION AND ASSESSMENT BOARD
WEIGHTAGE FRAMEWORK FOR MQP 1: II PUC MATHEMATICS(35):2024-25

Chapter	CONTENT	Number of Teaching hours	PART A		PART B	PART C	PART D	PART E		Total
			1 mark		2 mark	3 mark	5 mark			
			MCQ	FB				6 mark	4 mark	
1	RELATIONS AND FUNCTIONS	9	1			1	1			9
2	INVERSE TRIGONOMETRIC FUNCTIONS	6	1		1	1				6
3	MATRICES	9	1			1	1			9
4	DETERMINANTS	12	1		1		1		1	12
5	CONTINUITY AND DIFFERENTIABILITY	20	2	1	1	1	1		1	17
6	APPLICATION OF DERIVATIVES	10	2	1	1	1				8
7	INTEGRALS	22	2		1	1	1	1		18
8	APPLICATION OF INTEGRALS	5					1			5
9	DIFFERENTIAL EQUATIONS	10		1	1		1			8
10	VECTOR ALGEBRA	11	2	1	1	1				8
11	THREE D GEOMETRY	8	1		1	1				6
12	LINEAR ROGRAMMING	7						1		6
13	PROBABILITY	11	2	1	1	1				8
	TOTAL	140	15	5	9	9	7	2	2	120



GOVERNMENT OF KARNATAKA
KARNATAKA SCHOOL EXAMINATION AND ASSESSMENT BOARD
Model Question Paper -1

II P.U.C : MATHEMATICS (35): 2024-25

Time : 3 hours

Max. Marks : 80

Instructions :

- 1) The question paper has five parts namely A, B, C, D and E. Answer all the parts.
- 2) PART A has 15 MCQ's, 5 Fill in the blanks of 1 mark each.
- 3) Use the graph sheet for question on linear programming in PART E.
- 4) For questions having figure/graph, alternate questions are given at the end of question paper in separate section for visually challenged students.

PART A

I. Answer ALL the Multiple Choice Questions

15×1 = 15

1. Let the relation R in the set $A = \{x \in \mathbb{Z}: 0 \leq x \leq 12\}$, given by $R = \{(a, b): |a-b| \text{ is multiple of } 4\}$, then $[3]$, the equivalence class containing 3 is
A) $\{1, 5, 9\}$ B) ϕ C) A D) $\{3, 7, 11\}$
2. If $\cot^{-1} x = y$, then
(A) $0 \leq y \leq \pi$ (B) $0 < y < \pi$ (C) $-\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$ (D) $-\frac{\pi}{2} < y < \frac{\pi}{2}$.
3. If $A = [a_{ij}]$ is a symmetric matrix of order $m \times n$ then
(A) $m=n$ and $a_{ij}=0$ for $i \neq j$ B) $m=n$ and $a_{ij}=a_{ji}$ for all i, j
(C) $a_{ij}=a_{ji}$ for all i, j D) $m=n$ and $a_{ij}=-a_{ji}$ for all i, j
4. If $\begin{vmatrix} 3 & x \\ x & 1 \end{vmatrix} = \begin{vmatrix} 3 & 2 \\ 4 & 1 \end{vmatrix}$ then the value of x is equal to
A) 2 B) 4 C) 8 D) $\pm 2\sqrt{2}$.
5. Statement 1: Left hand derivative of $f(x) = |x|$ at $x = 0$ is -1.
Statement 2: Left hand derivative of $f(x)$ at $x = a$ is $\lim_{h \rightarrow 0} f(a-h)$
A) Statement 1 is true, and Statement 2 is false.
B) Statement 1 is true, and Statement 2 is true, Statement 2 is correct
Explanation for Statement 1
C) Statement 1 is true, and Statement 2 is true, Statement 2 is not a correct
Explanation for Statement 1
D) Statement 1 is false, and Statement 2 is false.

6. The derivative of $\log(\sec x + \tan x)$ with respect to x is

A) $\sec x$

B) $\tan x$

C) $\sec x \cdot \tan x$

D) $\frac{1}{\sec x + \tan x}$

7. The absolute maximum value of the function f given by

$f(x) = x^3, x \in [-2, 2]$ is

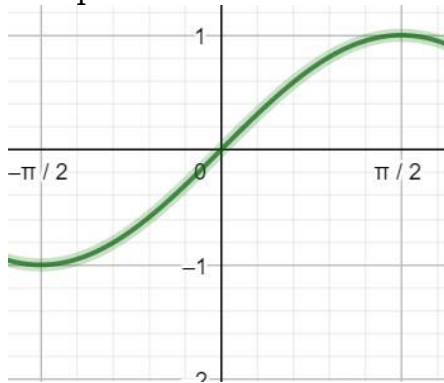
A) -2

B) 2

C) 0

D) 8

8. The point of inflection for the following graph is



A) $-\frac{\pi}{2}$

B) $\frac{\pi}{2}$

C) 0

D) point of inflection does not exist

9. $\int e^x \left(\frac{1}{x} - \frac{1}{x^2} \right) dx =$

A) $e^x + c$

B) $\frac{e^x}{x^2} + c$

(C) $\frac{e^x}{x} + c$

(D) $\frac{-e^x}{x} + c$

10. $\int x \sin x dx =$

A) $-x \cos x - \sin x + c$

B) $x \cos x + \sin x + c$

C) $x \cos x - \sin x + c$

D) $-\cos x - \sin x + c$

11. The projection vector of the vector \overrightarrow{AB} on the directed line l , if angle $\theta = \frac{\pi}{2}$ will be.

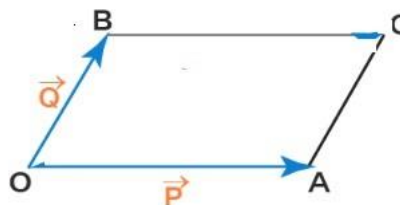
A) Zero vector.

B) \overrightarrow{AB}

C) \overrightarrow{BA}

D) Unit vector.

12. For the given figure, $\vec{P} - \vec{Q}$ is



A) \overrightarrow{OC}

B) \overrightarrow{CO}

C) \overrightarrow{BA}

D) \overrightarrow{AB}

13. The direction cosines of negative z-axis.

- (A) -1 , -1 , 0 (B) 0 , 0 , -1 (C) 0 , 0 , 1 (D) 1 , 1 , 0

14. If $P(A) = \frac{1}{2}$, $P(B) = 0$, then $P(A|B)$ is

- A) 0 B) $\frac{1}{2}$ C) 1 D) not defined

15. An urn contains 10 black and 5 white balls, 2 balls are drawn

one after the other without replacement, then the probability that both drawn balls are black is

- A) $\frac{3}{7}$ B) $\frac{4}{9}$ C) $\frac{2}{3}$ D) $\frac{2}{9}$

II. Fill in the blanks by choosing the appropriate answer from those given in the bracket (0, 1, 2, 3, 4, 5) 5 × 1 = 5

16. The number of points in R for which the function $f(x) = |x| + |x + 1|$ is not differentiable, is _____

17. The value of $\hat{i} \cdot (\hat{j} \times \hat{k}) - \hat{j} \cdot (\hat{k} \times \hat{i}) - \hat{k} \cdot (\hat{i} \times \hat{j})$ is _____

18. The sum of the order and degree of the differential equation.

$$2x^2 \left(\frac{d^2y}{dx^2} \right) - 3 \left(\frac{dy}{dx} \right) + y \text{ is } \underline{\hspace{2cm}}$$

19. The total revenue in rupees received from the sale of x unit of a product is given by $R(x) = 2x^2 - 4x + 5$, The marginal revenue when $x=2$ is _____

20. If $P(A) = \frac{3}{k}$, $P(A \cap B) = \frac{2}{5}$ and $P(B|A) = \frac{2}{3}$, then k is _____

PART B

Answer any SIX questions:

6 × 2 = 12

21. Show that $\sin^{-1}(2x\sqrt{1-x^2}) = 2\sin^{-1}(x)$, $-\frac{1}{\sqrt{2}} \leq x \leq \frac{1}{\sqrt{2}}$.

22. Show that points A (a, b + c), B (b, c + a), C (c, a + b) are collinear using determinants.

23. Find $\frac{dy}{dx}$, if $2x + 3y = \sin x$.

24. Find the local maximum value of the function $g(x) = x^3 - 3x$.

25. Evaluate $\int \sin 3x \cos 4x \, dx$.

26. Find the general solution of the differential equation $\frac{ydx - xdy}{y} = 0$.

27. Find $|\vec{x}|$, if for a unit vector \vec{a} , $(\vec{x} - \vec{a}) \cdot (\vec{x} + \vec{a}) = 15$.

- 28.** Find the equation of the line in vector form that passes through the point with position vector $2\hat{i} - \hat{j} + 4\hat{k}$ and is in the direction $\hat{i} + 2\hat{j} - \hat{k}$.
- 29.** Prove that if E and F are independent events, then so are the events E and F' .

PART C

Answer any SIX questions:

6×3 = 18.

- 30.** Show that the relation R in the set of real numbers **R** defined as $R = \{(a, b) : a \leq b\}$, is reflexive and transitive but not symmetric.
- 31.** Prove that $\cos^{-1} \frac{4}{5} + \cos^{-1} \frac{12}{13} = \cos^{-1} \frac{33}{65}$.
- 32.** Express $\begin{bmatrix} 3 & 5 \\ 1 & -1 \end{bmatrix}$ as the sum of a symmetric and a skew symmetric matrix.
- 33.** Find $\frac{dy}{dx}$ if $x = a(\cos \theta + \theta \sin \theta)$ and $y = a(\sin \theta - \theta \cos \theta)$.
- 34.** Find the intervals in which the function $f(x) = (x-2)^3(x+4)^3$ is
a) increasing b) decreasing.
- 35.** Find $\int \frac{x}{(x+1)(x+2)} dx$.
- 36.** If \vec{a} , \vec{b} & \vec{c} are three vectors such that $|\vec{a}| = 3$, $|\vec{b}| = 4$, $|\vec{c}| = 5$ and each vector is orthogonal to sum of the other two vectors then find $|\vec{a} + \vec{b} + \vec{c}|$.
- 37.** Find the distance between the lines $\vec{r} = 6\hat{i} + 2\hat{j} + 2\hat{k} + \lambda(\hat{i} - 2\hat{j} + 2\hat{k})$ and $\vec{r} = -4\hat{i} - \hat{k} + \mu(3\hat{i} - 2\hat{j} - 2\hat{k})$.
- 38.** Bag I contains 4 Red and 4 Black balls, Bag II contains 2 Red and 6 Black balls. One bag is selected at random and a ball is drawn is found to be Red. What is the probability that bag I is selected?

PART D

Answer any FOUR questions:

5× 4 = 20.

- 39.** State whether the function $f: \mathbf{R} \rightarrow \mathbf{R}$ defined by $f(x) = 3 - 4x$ is one-one, onto or bijective. Justify your answer.
- 40.** If $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$, prove that $A^3 - 6A^2 + 7A + 2I = O$.
- 41.** Solve the following system of equations by matrix method:
 $2x + y - z = 1$; $x + y = z$ and $2x + 3y + z = 11$.
- 42.** If $y = 3 \cos(\log x) + 4 \sin(\log x)$, prove that $x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + y = 0$.
- 43.** Find the integral of $\frac{1}{\sqrt{a^2 - x^2}}$ with respect to x and evaluate $\int \frac{dx}{\sqrt{7 - x^2}}$.

44. Solve the differential equation $\frac{dy}{dx} + y \sec x = \tan x$ ($0 \leq x \leq \pi/2$).

45. Find the area of the circle $x^2 + y^2 = a^2$ by the method of integration.

PART E

Answer the following questions:

46. Maximize and Minimise ; $z = 3x + 9y$ subject to constraints
 $x + 3y \leq 60$, $x + y \geq 10$, $x \leq y$, $x \geq 0$, $y \geq 0$ by graphical method.

OR

Prove that $\int_a^b f(x) dx = \int_a^b f(a+b-x) dx$ and hence evaluate $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{1}{1+\sqrt{\tan x}} dx$. **6**

47. Find the value of k so that the function $f(x) = \begin{cases} kx+1, & \text{if } x \leq 5 \\ 3x-5, & \text{if } x > 5 \end{cases}$, at $x=5$ is a continuous function.

OR

If $A = \begin{bmatrix} 2 & 3 \\ 1 & -4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -2 \\ -1 & 3 \end{bmatrix}$ then verify that $(AB)^{-1} = B^{-1}A^{-1}$.

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PART F

(For Visually Challenged Students only)

8. The point of inflection of the function $f(x) = \sin x$ in the interval

$\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ is

- A) $-\frac{\pi}{2}$ B) $\frac{\pi}{2}$ C) 0 D) point of inflection does not exist

12. In a parallelogram OACB, $\overrightarrow{OA} = \vec{P}$ and $\overrightarrow{OB} = \vec{Q}$, then $\vec{P} - \vec{Q}$ is

- A) \overrightarrow{OC} B) \overrightarrow{CO} C) \overrightarrow{BA} D) \overrightarrow{AB}
