**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 1 mark | | PART B 2 mark | PART C 3 mark | PART D 5 mark | PART E | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 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 ∈ Z: 0 ⩽ x ⩽ 12}, given by R={(a, b):|a-b| is multiple of 4}, then [3], the equivalence class containing 3 is

A) {1,5,9} B) $\phi$ 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=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 $\lim_{h \to 0} f(a-h)$

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(secx+tanx) with respect to x is

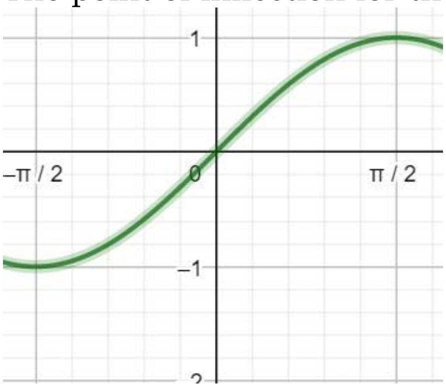
A)secx B) tanx C) secx.tanx D) $\frac{1}{secx+tanx}$

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

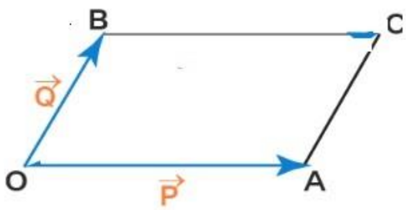
A) $-xcosx - sinx + c$ B) $xcosx + sinx + c$

C) $xcosx - sinx + c$ D) $-cosx - sinx + c$

**11.** The projection vector of the vector $\overrightarrow{\mathrm{AB}}$ 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 $\hat{\imath}.(\hat{\jmath} \times \hat{k}) - \hat{\jmath}.(\hat{k} \times \hat{\imath}) - \hat{k}.(\hat{\jmath} \times \hat{\imath})$ is________

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

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

**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∩ 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 $\sin^{-1}\left(2x\sqrt{1-x^2}\right) = 2\sin^{-1}(x), -\frac{1}{\sqrt{2}} \leq x \leq \frac{1}{\sqrt{2}}$ .

**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 $2\hat{\imath} - \hat{\jmath} + 4\hat{k}$ and is in the direction $\hat{\imath} + 2\hat{\jmath} - \hat{k}$.

**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 $R = \{(a,b) : a \le b\}$ ,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 $\vec{r} = 6\hat{\imath} + 2\hat{\jmath} + 2\hat{k} + \lambda(\hat{\imath} - 2\hat{\jmath} + 2\hat{k})$ and $\vec{r} = -4\hat{\imath} - \hat{k} + \mu(3\hat{\imath} - 2\hat{\jmath} - 2\hat{k})$.

**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 $f$: **R** →**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 $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$.

**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 secx = tanx $(0 \leq x \leq \pi/2)$.

**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 $f(x) = \begin{cases} kx+1, & if \ \ x \leq 5 \\ 3x-5, & if \ \ x > 5 \end{cases}$, 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 $(AB)^{-1} = B^{-1}A^{-1}$.

**4**

## PART F

## (For Visually Challenged Students only)

**8.** The point of inflection of the function f(x)=sinx 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) $\overrightarrow{AB}$

*******