GOVERNMENT OF KARNATAKA
KARNATAKA SCHOOL EXAMINATION AND ASSESSMENT BOARD
WEIGHTAGE FRAMEWORK FOR MQP 2: 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	2	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	1		2	1				8
7	INTEGRALS	22	1	1	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

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Model Question Paper -2

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. If a relation R on the set {1, 2, 3} is defined by R = {(1, 1)}, then R is
(A) symmetric but not transitive (B) transitive but not symmetric
(C) symmetric and transitive. (D) neither symmetric nor transitive.

2. $\sin(\tan^{-1}x)$, $|x| < 1$ is equal to

(A) $\frac{\sqrt{1-x^2}}{x}$ (B) $\frac{x}{\sqrt{1-x^2}}$ (C) $\frac{1}{1+x^2}$ (D) $\frac{x}{\sqrt{1+x^2}}$.

3. Match List I with List II

List I	List II
a) Domain of $\sin^{-1}x$	i) $(-\infty, \infty)$
b) Domain of $tan^{-1}x$	ii) $[o, \pi]$
c) Range of $cos^{-1}x$	iii) [-1, 1]

Choose the correct answer from the options given below:
A) a-i , b-ii, c-iii B) a-iii, b-ii, c-i
C) a-ii, b-i, c-iii D) a-iii, b-i, c-ii

4. Statement 1: If A is a symmetric as well as a skew symmetric matrix, then A is a null matrix
Statement 2**:** A is a symmetric matrix if $A^T = A$ and A is a skew symmetric matrix if $A^T = -A$.
A) Statement 1 is true and Statement 2 is false.
B) Statement 1 is false and Statement 2 is false.
C) Statement 1 is true and Statement 2 is true, Statement 2 is not a correct explanation for Statement 1
D) Statement 1 is true and Statement 2 is true, Statement 2 is a correct explanation for Statement 1

5. If A is a square matrix of order 3 and $|A| = 3$, then $|A^{-1}| =$

A) 3 B) $\frac{2}{3}$ C) $\frac{1}{3}$ D) 12

6. For the figure given below, consider the following statements 1 and 2

Statement 1: The given function is differentiable at x = 1

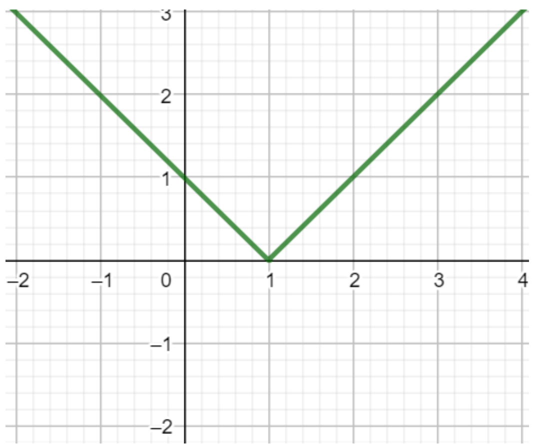
Statement 2: The given function is continuous at x = 0

A) Statement 1 is true and Statement 2 is false

B) Statement 1 is false and Statement 2 is true

C) Both Statement 1 and 2 are true

D) Both Statement 1 and 2 are false



7. If $y = e^{\log x}$, then $\frac{dy}{dx} =$

(A) $\frac{1}{x}$ B) $e^{\log x}$ C) -1 D) 1.

8. The function f given by $f(x) = \log(\sin x)$ is increasing on

(A) $(0, \pi)$ B) $\left(\pi, \frac{3\pi}{2}\right)$ C) $\left(\frac{\pi}{2}, \pi\right)$ D) $\left(\frac{3\pi}{2}, 2\pi\right)$.

9. $\int \frac{1}{x\sqrt{x^2-1}} dx =$

A) $\sec x + C$ B) $cosec^{-1} x + C$ C) $\sec^{-1} x + C$ D) $cosec x + C$

10. A differential equation of the form $\frac{dy}{dx} = F(x, y)$ is said to be *homogenous* if $F(x, y)$ is a homogenous function of degree

A) 1 B) 2 C) n D) 0.

11. The projection of the vector $\vec{a} = 2\hat{\imath} + 3\hat{\jmath} + 2\hat{k}$ on y-axis is

A) $\frac{3}{\sqrt{17}}$ B) 3 C) $\frac{8}{\sqrt{17}}$ D) $\frac{2}{\sqrt{17}}$.

12. Unit vector in the direction of the vector $\vec{a} = \hat{\imath} + \hat{\jmath} + 2\hat{k}$ is

A) $\frac{\hat{\imath}+\hat{\jmath}+2\hat{k}}{\sqrt{6}}$ B) $\frac{\hat{\imath}+\hat{\jmath}+2\hat{k}}{6}$ C) $\frac{\hat{\imath}+\hat{\jmath}+2\hat{k}}{4}$ D) $\frac{\hat{\imath}+\hat{\jmath}+2\hat{k}}{2}$

13. The equation of a line parallel to x-axis and passing through the origin is

A) $\frac{x}{0} = \frac{y}{1} = \frac{z}{1}$ B) $\frac{x}{1} = \frac{y}{0} = \frac{z}{0}$

C) $\frac{x+5}{0} = \frac{y-2}{1} = \frac{z+3}{0}$ D) $\frac{x-5}{0} = \frac{y+2}{0} = \frac{z-3}{1}$.

14. If $P(A) = 0.4$ $P(B) = 0.5$ *and* $P(A \cap B) = 0.25$ then $P(A'|B)$ *is*

A) $\frac{1}{2}$ B) $\frac{5}{8}$ C) $\frac{1}{4}$ D) $\frac{3}{4}$.

15. If A and B are independent events with $P(A) = 0.3, P(B) = 0.4$ then $P(A|B)$

A) 0.3 B) 0.4 C) 0.12 D) 0.7

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

16. The value of $\cos\left(\frac{\pi}{3} + sin^{-1}\left(\frac{1}{2}\right)\right)$ =______________

17. The number of points at which f(x)=[x], where [x] is greatest integer function is discontinuous in the interval (-2, 2) is __________

18. $\int_0^{\frac{\pi}{2}}\left(sin^2\frac{x}{2} - cos^2\frac{x}{2}\right)\, dx =$

19. If $\left(2\vec{a} - 3\vec{b}\right) \times \left(3\vec{a} - 2\vec{b}\right) = \lambda\left(\vec{a} \times \vec{b}\right)$, then the value of λ is _____

20. Probability of solving a specific problem independently by A and B are $\frac{1}{2}$ and $\frac{1}{3}$ respectively. If both try to solve the problem then the probability that the problem is solved is $\frac{k}{3}$, then the value of k is ________

PART B

Answer any SIX questions: **6 × 2=12**

21. Find 'k' if area of the triangle with vertices (2,-6) , (5,4) and (k,4) is 35 square units.

22. If $x = 4t$, $y = \frac{4}{t}$, then find $\frac{dy}{dx}$.

23. The radius of an air bubble is increasing at the rate of 0.5 cm/s. At what rate is the volume of the bubble is increasing when the radius is 1 cm ?

24. Find the two numbers whose sum is 24 and product is as large as possible.

25. Evaluate: $\int \frac{x^3 - x^2 + x - 1}{x - 1} dx$.

26. Find the general solution of the differential equation $\frac{dy}{dx} = \sqrt{1 - x^2 + y^2 - x^2y^2}$.

27. Find the area of the parallelogram whose adjacent sides are the vectors $3\hat{\imath} + \hat{\jmath} + 4\hat{k}$ and $\hat{\imath} - \hat{\jmath} + \hat{k}$.

28. Find the angle between the pair of lines $\frac{x+3}{3} = \frac{y-1}{5} = \frac{z+3}{4}$ and $\frac{x+1}{1} = \frac{y-4}{1} = \frac{z-5}{2}$.

29. A couple has two children. Find the probability that both children are males, if it is known that at least one of the children is male.

PART C

Answer any SIX questions: **6 × 3 = 18**

30. Let L be the set of all lines in a plane and R be the relation in L defined as R = $\{(L_1, L_2) : L_1$ is perpendicular to $L_2\}$. Show that R is symmetric but neither reflexive nor transitive.

31. Solve: $2\tan^{-1}(cosx) = \tan^{-1}(2cosecx)$.

32. Find 'x', if $\begin{bmatrix} x & -5 & -1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix} \begin{bmatrix} x \\ 4 \\ 1 \end{bmatrix} = O$.

33. If $y = 3e^{2x} + 2e^{3x}$, prove that $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0$.

34. Find the intervals in which the function f is given by f(x) = $x^3 + \frac{1}{x^3}$ is

a) decreasing b) increasing.

35. Evaluate: $\int \frac{3x-2}{(x+1)^2(x+3)} dx$.

36. Show that the position vector of the point R, which divides the line joining the points P and Q having the position vectors $\vec{a}$ and $\vec{b}$ internally in the ratio $m:n$ is $\frac{m\vec{b}+n\vec{a}}{m+n}$.

37. Derive the equation of the line in space passing through a given point and parallel to a given vector in the vector form.

38. A man is known to speak truth 3 out of 5 times. He throws a die and reports that it is a six. Find the probability that it is actually a six.

PART D

Answer any FOUR questions: **4 × 5=20**

39. Consider the function f: A → B defined by $f(x) = \left(\frac{x-2}{x-3}\right)$. Is f one-one and onto? Justify your answer.

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

41. Use the product $\begin{pmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{pmatrix} \begin{pmatrix} -2 & 0 & 1 \\ 9 & 2 & -3 \\ 6 & 1 & -2 \end{pmatrix}$ to solve the system of equations

$x - y + 2z = 1,\ 2y - 3z = 1,\ 3x - 2y + 4z = 9.$

42. Find the values of a and b such that

$$f(x) = \begin{cases} 5 & if\ x \le 2 \\ ax + b & if\ 2 < x < 10 \\ 21 & if\ x \ge 10 \end{cases}$$ is continuous function.

43. Find the integral of $\frac{1}{\sqrt{x^2+a^2}}$ w.r.t x and hence evaluate $\int \frac{1}{\sqrt{x^2+121}} dx$.

44. Find the area of the region bounded by the ellipse $\frac{x^2}{16}+\frac{y^2}{9}=1$ by integration method.

45. Solve the differential equation $ydx-\left(x+2y^2\right)dy=0$.

PART E

Answer the following questions:

46.Prove that $\int_a^b f(x)dx=\int_a^c f(x)dx+\int_c^b f(x)dx$ and hence evaluate $\int_{-1}^{2}|x^3-x|\,dx$.

OR

Solve the following problem graphically: Maximize and minimize $Z=3x+2y$, Subject to the constraints, $x+2y\le 10, 3x+y\le 15, x,y\ge 0$. **6**

47. Show that the matrix A $=\begin{bmatrix}5 & 6\\4 & 3\end{bmatrix}$ satisfies the equation A^2 – 8A -9I = O, where I is 2 × 2 identity matrix and O is 2 × 2 zero matrix. Using this equation, find A^{-1}.

OR

Differentiate $(sinx)^x+\sin^{-1}x$ w.r.t. x. **4**

PART F

(For Visually Challenged Students only)

6. For the function f(x)=|x-1|, consider the following statements 1 and 2

Statement 1: The given function is differentiable at x=1

Statement 2: The given function is continuous at x=0

A) Statement 1 is true and Statement 2 is false

B) Statement 1 is false and Statement 2 is true

C) Both Statement 1 and 2 are true

D) Both Statement 1 and 2 are false

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