GOVERNMENT OF KARNATAKA
KARNATAKA SCHOOL EXAMINATION AND ASSESSMENT BOARD

Model Question Paper - 2

II P.U.C: MATHEMATICS (35): 2025-26

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 x 1 = 15**

1. If a relation R on the set {1, 2, 3} be defined by R = {(1, 1), (2, 2)}, then R is

(A) symmetric but not transitive (B) transitive but not symmetric
(C) symmetric and transitive. (D) neither symmetric nor transitive.

2. Match Column I with Column II

Column I	Column II
a) Domain of $sec^{-1}x$	i) $R-(-1,1)$
b) Range of $cosec^{-1}x$	ii) $(0,\pi)$
c) Range of $cot^{-1}x$	iii) $\left[-\frac{\pi}{2},\frac{\pi}{2}\right]-\{0\}$

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-i, b-iii, c-ii D) a-iii, b-i, c-ii

3. The matrix $A=\begin{bmatrix}0 & 2b & -2\\ 3 & 1 & 3\\ 3a & 3 & -1\end{bmatrix}$ is a symmetric matrix. Then the value of a and b respectively are:

(A) $-\frac{2}{3},\frac{3}{2}$ (B) $-\frac{1}{2},\frac{1}{2}$ (C) $-2,2$ (D) $\frac{3}{2},\frac{1}{2}$

4. A and are invertible matrices of the same order such that $|AB|=8$ if $|A|=2$ *then* $|B|$ *is*

(A) 4 (B) 16 (C) 1/4 (D) 1/16

5. The function $f(x) = [x]$, where [.] is greatest integer function is _____

(A) discontinuous only for integral x (B) a constant function
(C) continuous for all x (D) derivable for all x

6. The derivative of $e^{\log_e x}$ with respect to x is

(A) $e^{\log_e x}$ (B) $\frac{1}{x}$ (C) 1 (D) $\frac{e^{\log_e x^2}}{x}$

7. The total revenue in rupees received from the sale of x units of a product is R (x) = $3x^2 + 36x + 5$, then the marginal revenue when $x = 15$ is ..... Rupees

(A) 116 (B) 96 (C) 90 (D) 126

8. 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

9. $\int \frac{2-3\sin x}{\cos^2 x} dx$ =

(A) $2\tan x - 3\sec x + c$ (B) $2\tan x + 3\sec x + c$

(C) $2\tan x - 2\sec x + c$ (D) $2\sec x - 3\tan x + c$

10. $\int_1^{\sqrt{3}} \left(\frac{1}{1+x^2} \right) dx =$

(A) $\frac{\pi}{3}$ (B) $\frac{2\pi}{3}$ (C) $\frac{\pi}{6}$ (D) $\frac{\pi}{12}$

11. **Statement 1:** If either $|\vec{a}| = 0$ or $|\vec{b}| = 0$ then $\vec{a}.\vec{b} = 0$

Statement 2: If $\vec{a} \times \vec{b} = \vec{0}$, *then* $\vec{a} \perp$ *to* $\vec{b}$.

(A) Statement 1 is true and Statement 2 is false

(B) Statement 1 is false and Statement 2 is true

(C) Statement 1 is true and Statement 2 is true

(D) Statement 1 is false and Statement 2 is false

12. If $|\vec{a}.\vec{b}| = -|\vec{a}||\vec{b}|$ then the angle between $\vec{a}$ & $\vec{b}$ *is*

(A) $\frac{\pi}{4}$ (B) $\frac{\pi}{2}$ (C) π (D) $\frac{\pi}{3}$

13. The direction ratios of x -axis.

(A) 0, k, 0 (B) 0, 0, k (C) k, 0, 0 (D) k, k, k

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

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

15. Two balls are drawn at random with replacement from a box containing 10 black and 8 red balls, then the probability that both are red

(A) $\frac{25}{81}$ (B) $\frac{16}{81}$ (C) $\frac{20}{81}$ (D) $\frac{28}{153}$

II. Fill in the blanks by choosing the appropriate answer from those given in the bracket $(0, -1, 2, 3, 5, 10)$ **5 x 1= 5**

16. $\frac{d}{dx}(3x^x)$ at x =1 is = ____

17. Minimum value of f(x) = $|x + 2| - 1$ is_____

18. Find the number of arbitrary constants in the particular solution of a differential equation of third order is _____

19. The scalar product of $\lambda i + j - 3k$ and $3i - 4j + 7k$ is -10, then the value of λ is _____

20. If $P(A) = \frac{3}{5}, P(B) = \frac{5}{10}$ and A and B are independent events then $P(A \cap B) = \frac{3}{k}$,then k=_____

PART –B

III. Answer Any Six Questions **6 x 2 =12**

21. Prove that $\sin^{-1}\left(2x\sqrt{1-x^2}\right)=2\sin^{-1}x,\ \frac{-1}{\sqrt{2}}\le x\le\frac{1}{\sqrt{2}}$

22. Find the equation of the line joining the points $(3,1)$ and $(9,3)$ using determinants

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

24. Find the rate of change of the area of a circle with respect to its radius r at $r=6\ cm$.

25. Find $\int \sin 2x\cos 3x\,dx$

26. Find the general solution of the differential equation $\frac{dy}{dx}=\frac{x+1}{2-y},(y\neq 2)$

27. Find the projection of the vector $\vec{a}=2\vec{i}+3\vec{j}+2\vec{k}$ on the vector $\vec{b}=\vec{i}+2\vec{j}+\vec{k}$.

28. Find the vector and Cartesian equation of the line passing through the point (5,2,-4) and parallel to the vector $3\vec{i}+2\vec{j}-8\vec{k}$

29. A die is tossed thrice. Find the probability of getting an odd number at least once

PART – C

IV. Answer Any Six Questions **6 x 3 =18**

30. Show that the relation R on the set $A=\{x\in Z:0\le x\le 12\}$, given by

R = {(a, b) : $|a-b|$ is a multiple of 4} is an equivalence relation

31. Prove that $\cos^{-1}\frac{4}{5}+\cos^{-1}\frac{12}{13}=\cos^{-1}\frac{33}{65}$

32. Prove that for any square matrix A with real number entries, $A+A'$ is a symmetric matrix and $A-A'$ is a skew symmetric matrix.

33. Find $\frac{dy}{dx}$, if $x=a(\theta+\sin\theta),\ y=a(1-\cos\theta)$.

34. Find the intervals in which the function f given by $f(x)=2x^3-3x^2-36x+7$ is strictly decreasing

35. Find $\int x\tan^{-1}x\,dx$

36. Find the unit vector perpendicular to each of the vectors $(\vec{a}+\vec{b})$ & $(\vec{a}-\vec{b})$, where $\vec{a}=3\vec{i}+2\vec{j}+2\vec{k}$ & $\vec{b}=\vec{i}+2\vec{j}-2\vec{k}$.

37. Find the distance between the lines
$\vec{r}=\vec{i}+2\vec{j}-4\vec{k}+\lambda(2\vec{i}+3\vec{j}+6\vec{k})$ & $\vec{r}=3i+3\vec{j}-5\vec{k}+\mu(2\vec{i}+3\vec{j}+6\vec{k})$

38. Of the students in a college, it is known that 60% reside in hostel and 40% are day scholars (not residing in hostel). Previous year results report that 30% of all students who reside in hostel attain A grade and 20% of day scholar attain A grade in their annual examination. At the end of the year, one student is chosen at random from the college and he has an A grade, what is the probability that the student is a hostile?

PART – D

V. Answer Any Four Questions **4 x 5 = 20**

39. Consider $f : R \to R$ given by f(x) = 4x +3. Show that f is invertible. Find the inverse.

40. If $A = \begin{bmatrix} 1 & 2 & -3 \\ 5 & 0 & 2 \\ 1 & -1 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 3 & -1 & 2 \\ 4 & 2 & 5 \\ 2 & 0 & 3 \end{bmatrix}$ and $C = \begin{bmatrix} 4 & 1 & 2 \\ 0 & 3 & 2 \\ 1 & -2 & 3 \end{bmatrix}$

Then compute (A + B) and (B – C). Also, verify that A + (B – C) = (A + B) – C

41. Solve the system of equations $x + y + z = 6$, $y + 3z = 11$ and $x - 2y + z = 0$ by matrix method.

42. If $y = \sin^{-1} x$, then prove that $(1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} = 0.$

43. *Find* the integral of $\frac{1}{x^2 - a^2}$ with respect to x and evaluate $\int \frac{dx}{x^2 - 16}$

44. Using the method of integration, find the area enclosed by the circle $x^2 + y^2 = a^2$

45. Find the general solution of the differential equation $\frac{dy}{dx} + y\cot x = 4x\,\mathrm{cosec}\,x (x \neq 0).$

PART – E

VI. Answer The Following Questions

46. Prove that $\int_{-a}^{a} f(x)dx = \begin{cases} 2\int_0^a f(x)dx & \text{if f(x) is even} \\ 0 & \text{if f(x) is odd} \end{cases}$ hence evaluate $\int_{-\pi/2}^{\pi/2} (x^3 + x\cos x + \tan^5 x)dx$. **6M**

OR

Solve the following graphically, Minimize Z = 200x + 500y, subject to the constraints $x + 2y \geq 10$, $3x + 4y \leq 24$, x ≥ 0, y ≥ 0.

47. If $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$ satisfies the equation $A^2 - 4A + I = O$, then find the inverse of A using this equation, where I is the identity matrix of order 2 and O is the zero matrix of order 2 **4M**

OR

Determine the value of k, if $f(x) = \begin{cases} \frac{k\cos x}{\pi - 2x}, & if\ x \neq \frac{\pi}{2} \\ 3, & if\ x = \frac{\pi}{2} \end{cases}$ is continuous at $x = \frac{\pi}{2}$.