GOVERNMENT OF KARNATAKA
KARNATAKA SCHOOL EXAMINATION AND ASSESSMENT BOARD

Model Question Paper - 1

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 × 1 = 15**

1. Consider the following equivalence relation R on Z , the set of integers $\mathbf{R}=\{(\mathbf{a},\mathbf{b})|\mathbf{2 \text{ divides } a-b}\}$. If [x] represents the equivalence class of x, then [0] is the set

   A) $\{0,\pm2,\pm4,\pm6,\pm8,........\}$ B) $\{1,\pm3,\pm5,\pm7,\pm9,........\}$

   C) $\{0,\pm1,\pm2,\pm3,\pm4,........\}$ D) $\{.......-4,-1,2,5,8.......\}$

2. If $\mathbf{sin^{-1}x=\theta}$ (the principal value branch of $\mathbf{sin^{-1}}$x where $\mathbf{0\le x\le 1}$, then the range in which $\boldsymbol{\theta}$ lies

   A) $\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$ B) $\left[0,\frac{\pi}{2}\right]$ C) $[0,\pi]$ D) $-1\le x\le 1$

3. The product of matrices A and B is equal to a diagonal matrix. If the order of the matrix B is 2x3, then order of the matrix A is

   A) 3x3 B) 2x2 C) 3x2 D) 2x3

4. Let A be a 2x2 square matrix such that $\mathbf{A}=\begin{bmatrix}\mathbf{5} & \mathbf{0}\\ \mathbf{0} & \mathbf{5}\end{bmatrix}$ then value of $|\mathbf{adjA}|$ is

   A) 25 B) 5 C) 0 D) I

5. For some fixed a>0 and x>0, $\mathbf{y=a^x+x^a+a^a}$ then find $\mathbf{\frac{dy}{dx}}=$

   A) $a^x\,log_e a+a^x(a-1)+aa^{a-1}$

   B) $a^x\,log_e a+x^{a-1}$

   C) $a^x\,log_e a+ax^{a-1}$

   D) $a^x\,log_e a+x^a\log x+a^a\log a$

6. Choose the statement that is *not true* from the options given below:

   A) Every polynomial function is continuous.

   B) Every rational function is continuous.

   C) Every differentiable function is continuous.

   D) Every continuous function is differentiable.

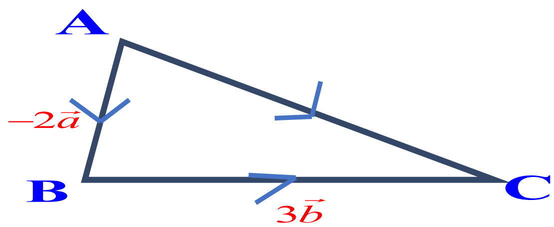
7. Let C be the circumference and A be the area of a circle
Statement 1: The rate of change of the area with respective to radius is equal to C
Statement 2: The rate of change of the area with respective to diameter is C/2
A) Only Statement 1 is true B) Only statement 2 is true
C) Both statements are true D) Both statements are false

8. Function $f(x)=a^x$ is increasing on R, if
A) a>0 B) a<0 C)0<a<1 D) a>1

9. The anti-derivative of $\frac{1}{x\sqrt{x^2-1}}, x>1$ with respective to x
A) $\sin^{-1}x+C$ B) $\cos^{-1}x+C$ C) $-\operatorname{cosec}^{-1}x+C$ D) $cot^{-1}x+C$

10. Find the value of $\int_{-1}^{1} x^{99}dx =$_______
A) 2 B) 3 C) 0 D) 1

11. For the given figure, $\overrightarrow{AC}$ is



A) $2\vec{a}-3\vec{b}$ B) $3\vec{b}-2\vec{a}$ C) $\vec{a}+\vec{b}$ D) $2\vec{a}+\vec{b}$

12. The direction ratios of the vectors joining the points $\mathbf{P(2,3,0)}$ **&** $\mathbf{Q(-1,-2,4)}$ directed form P to Q are
A) $(-3,-5,4)$ B) $(-3,-5,-4)$ C) $(-1,-2,-4)$ D) $(1,1,1)$

13. The cartesian equation of a line is $\frac{x-5}{3}=\frac{y+4}{7}=\frac{z-6}{2}$ then the vector equation is
A) $\vec{r}=(-5\vec{i}+4\vec{j}-6\vec{k})+\lambda(3\vec{i}+7\vec{j}+2\vec{k})$ B) $\vec{r}=(5\vec{i}+4\vec{j}-6\vec{k})+\lambda(3\vec{i}+7\vec{j}+2\vec{k})$
C) $\vec{r}=(5\vec{i}-4\vec{j}+6\vec{k})+\lambda(3\vec{i}+7\vec{j}+2\vec{k})$ D) $\vec{r}=(3\vec{i}+7\vec{j}+2\vec{k})+\lambda(5\vec{i}-4\vec{j}+6\vec{k})$

14. Two cards are drawn at random and without replacement from a pack of 52 playing cards. Find the probability that both the cards are black is
A) $\frac{1}{26}$ B) $\frac{1}{4}$ C) $\frac{25}{102}$ D) $\frac{25}{104}$

15. A and B are two events such that $P(A)=\frac{1}{2}$, $P(A\cup B)=\frac{3}{5}$, $P(B)=q$ then the value of q if A and B are mutually exclusive events
A) $\frac{3}{10}$ B) $\frac{1}{10}$ C) $\frac{1}{5}$ D) $\frac{7}{10}$

II. Fill in the blanks by choosing the appropriate answer from those given in the bracket (-1, 6, 0, 1, 4, 3) **5 × 1 = 5**

16. If $\mathbf{xy=81}$, then $\frac{dy}{dx}$ *at* $x=9$ is _______

17. The absolute maximum value of the function f given by $\mathbf{f(x)=x^2}$, $x\in[0,2]$ is ________

18. If m and n respectively are the order and degree of the differential equation $1+\left(\frac{dy}{dx}\right)^3=7\left(\frac{d^2y}{dx^2}\right)^2$ then $m-n$ =_____

19. The value of λ for which the vectors $\mathbf{2\vec{i}-3\vec{j}+4\vec{k}}$ & $\mathbf{-4\vec{i}+\lambda\vec{j}-8\vec{k}}$ are collinear is ______

20. If F be an event of a sample space S, then $P\left(\frac{S}{F}\right)=$_____

PART B

III. Answer Any Six Questions: **6 × 2 = 12**

21. Find the value of $tan^{-1}\left[2cos\left(2sin^{-1}\frac{1}{2}\right)\right]$

22. Find the area of the triangle whose, vertices are $(3,8),(-4,2)\&(5,1)$ using determinants

23. Find $\frac{dy}{dx}$, if $y=\sin^{-1}\left(\frac{2x}{1+x^2}\right)$, -1 < x < 1.

24. Find the interval in which of the function f given by $f(x)=x^2+2x-5$ is strictly increasing

25. Find $\int\frac{x\,sin^{-1}x}{\sqrt{1-x^2}}dx$

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

27. Find the area of the parallelogram whose adjacent sides are given by the vectors $\vec{a}=3\vec{i}+\vec{j}+4\vec{k}$ & $\vec{b}=\vec{i}-\vec{j}+\vec{k}$

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

29. A die is thrown. If E is the event the number appearing is a multiple of '3' and F be the event the number appearing is 'even' then find whether E & F are independent?

PART C

IV. 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. Find the simplest form of $tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right), x\neq 0$

32. Express the matrix $A=\begin{bmatrix}1 & 4\\ 6 & 7\end{bmatrix}$ as the sum of symmetric and skew symmetric matrix

33. Differentiate, $y=(sin\,x)^x+sin^{-1}x$ w.r.t.x

34. Find the positive numbers whose sum is 15 and the sum of whose squares is minimum

35. Integrate $\frac{x}{(x+1)(x+2)}$ with respect to x by partial fraction

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

38. There are two boxes, namely box-I and box-II. Box-I contains 3 red and 6 black balls. Box-II contains 5 red and 5 black balls, one of the two boxes I selected at random and a ball is drawn from the box which is found to be red. Find the probability that the red ball comes out from the box-II

PART D

V. Answer Any Four Questions: **5 × 4 = 20**

39. State weather the function $f:R\rightarrow R$ defined by $f(x)=3-4x$ is one-one, onto or bijective. Justify your answer

40. If $A=\begin{bmatrix}0 & 6 & 7\\ -6 & 0 & 8\\ 7 & -8 & 0\end{bmatrix},B=\begin{bmatrix}0 & 1 & 1\\ 1 & 0 & 2\\ 1 & 2 & 0\end{bmatrix},C=\begin{bmatrix}2\\ -2\\ 3\end{bmatrix}$

Calculate AC, BC and (A + B) C. Also, verify that (A + B) C = AC + BC.

41. Solve the system of linear equations by matrix method

$4x+3y+2z=60,\ 2x+4y+6z=90\ \&\ 6x+2y+3z=70$

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

43. Find the integral of $\frac{1}{\sqrt{a^2-x^2}}$ with respect to x and hence evaluate $\int\frac{dx}{\sqrt{25-x^2}}$

44. Find the area of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ by the method of integration

45. Find the general solution of the differential equation $\frac{dy}{dx}+2y=\sin x$

PART E

VI. Answer The Following Questions:

46. Prove that $\int_0^a f(x)\,dx = \int_0^a f(a-x)\,dx$ and hence evaluate $\int_0^4 \frac{\sqrt{x}}{\sqrt{x}+\sqrt{4-x}}\,dx$ **6M**

OR

Solve the following graphically, maximise $Z = 250x + 75y$ subject to the constraints $x + y \le 60,\ 25x + 5y \le 500,\ x \ge 0,\ y \ge 0$

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

OR

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

PART F

(For Visually Challenged Students only)

11. In a ΔABC, $\overrightarrow{BA} = 2\vec{a}$, $\overrightarrow{BC} = 3\vec{b}$ then $\overrightarrow{AC}$ is

A) $2\vec{a} - 3\vec{b}$ B) $3\vec{b} - 2\vec{a}$ C) $\vec{a} + \vec{b}$ D) $2\vec{a} + \vec{b}$

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