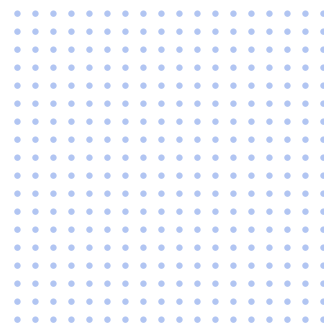




FOR KARNATAKA 2ND PUC EXAM PREPARATION

Karnataka 2nd PUC 2027 Sample Paper · Mathematics

EXAM

Karnataka 2nd PUC

YEAR

2027

TYPE

Sample Paper

SUBJECT

Mathematics



**GOVERNMENT OF KARNATAKA
KARNATAKA SCHOOL EXAMINATION AND ASSESSMENT BOARD**

Model Question Paper - 1

II P.U.C: MATHEMATICS (35): 2026-27

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
 $R = \{(a, b) | 2 \text{ divides } a - b\}$. If [x] represents the equivalence class of x, then [0] is the set
 A) $\{0, \pm 2, \pm 4, \pm 6, \pm 8, \dots\}$ B) $\{1, \pm 3, \pm 5, \pm 7, \pm 9, \dots\}$
 C) $\{0, \pm 1, \pm 2, \pm 3, \pm 4, \dots\}$ D) $\{\dots - 4, -1, 2, 5, 8, \dots\}$
2. If $\sin^{-1}x = \theta$ (the principal value branch of $\sin^{-1}x$ where $0 \leq x \leq 1$, then the range in which θ lies
 A) $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ B) $\left[0, \frac{\pi}{2}\right]$ C) $[0, \pi]$ D) $-1 \leq x \leq 1$
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 $A = \begin{bmatrix} 5 & 0 \\ 0 & 5 \end{bmatrix}$ then value of $|\text{adj}A|$ is
 A) 25 B) 5 C) 0 D) I
5. For some fixed $a > 0$ and $x > 0$, $y = a^x + x^a + a^a$ then find $\frac{dy}{dx} =$
 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 respect to radius is equal to C

Statement 2: The rate of change of the area with respect 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) $a > 1$

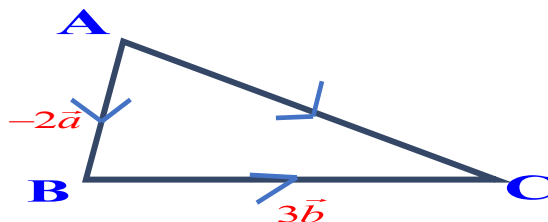
9. The anti-derivative of $\frac{1}{x\sqrt{x^2-1}}$, $x > 1$ with respect to x

A) $\sin^{-1} x + C$
 B) $\cos^{-1} x + C$
 C) $-\cos^{-1} x + C$
 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 $P(2,3,0)$ & $Q(-1,-2,4)$ directed from 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 $xy = 81$, then $\frac{dy}{dx}$ at $x = 9$ is _____

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

18. If m and n respectively are the order and degree of the differential equation

$$1 + \left(\frac{dy}{dx}\right)^3 = 7\left(\frac{d^2y}{dx^2}\right)^2 \text{ then } m - n = \text{_____}$$

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

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

PART B

III. Answer Any Six Questions:

6 × 2 = 12

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

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

$R = \{(L_1, L_2) : L_1 \text{ is perpendicular to } L_2\}$. 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 whether 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

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

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
 $x + y \leq 60$, $25x + 5y \leq 500$, $x \geq 0$, $y \geq 0$

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 $f(x) = \begin{cases} kx+1, & \text{if } x \leq 5 \\ 3x-5, & \text{if } x > 5 \end{cases}$ is a continuous at $x=5$

PART F**(For Visually Challenged Students only)**

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

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