



**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  $\theta$  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)  $-\operatorname{cosec}^{-1} x + C$

D)  $\cot^{-1} x + C$

10. Find the value of  $\int_{-1}^1 x^{99} dx =$  \_\_\_\_\_

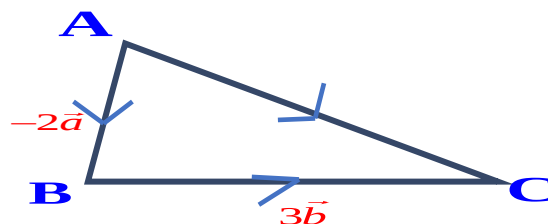
A) 2

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  $P(2,3,0)$  &  $Q(-1,-2,4)$  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

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

19. The value of  $\lambda$  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  $P\left(\frac{S}{F}\right) = \underline{\hspace{2cm}}$

### 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)  $2\vec{a} + \vec{b}$

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