GOVERNMENT OF KARNATAKA
KARNATAKA SCHOOL EXAMINATION AND ASSESSMENT BOARD
II PUC MODEL QUESTION PAPER-2   (2024-2025)
BASIC MATHEMATICS (75)

TIME: 3 Hours   **Max. Marks:80**

Instructions:
   i.   The question paper has 5 Parts A, B, C, D and E. Answer all the Parts.
   ii. Part - A carries 20 marks, Part - B carries 12 marks, Part - C carries 18 marks,
        Part - D carries 20 marks and Part - E carries 10 marks.
   iii. Write the question number properly as indicated in the question paper.

PART-A

I.   Answer ALL the multiple-choice questions: $10 \times 1 = 10$

1. If $A = \begin{bmatrix} 1 & -2 \\ 3 & 4 \end{bmatrix}$, find $adj\ A$

a) $\begin{bmatrix} 4 & 2 \\ 3 & 1 \end{bmatrix}$, b) $\begin{bmatrix} 4 & 2 \\ -3 & 1 \end{bmatrix}$ c) $\begin{bmatrix} -4 & -2 \\ 3 & 1 \end{bmatrix}$ d) $\begin{bmatrix} 4 & 2 \\ 3 & -1 \end{bmatrix}$

2. If $9c_x + 9c_7 = 10c_7$ then the value of x is

a) 6 b) 7 c) 5 d) 16

3. $P(Sure\ Event)$ is

a) 1 b) 0 c) 0.5 d) 0.25

4. **Negate:** $\sim p \wedge q$

a) $p \rightarrow \sim q$ b) $\sim p \wedge \sim q$ c) $p \vee \sim q$ d) $p \wedge q$

5. The compound ratio of $2 : 3\ and\ 7 : 5$ is

a) $2 : 5$ b) $15 : 14$ c) $9 : 8$ d) $14 : 15$

6. The value of $4\cos^3 10^0 - 3\cos 10^0$ is

a) $\frac{\sqrt{3}}{2}$ b) $\frac{1}{\sqrt{2}}$ c) $\frac{1}{2}$ d) 0

7. The equation of the parabola whose focus is $(3, 0)$ is

a) $x^2 = 12y$ b) $x^2 = -12y$ c) $y^2 = 12x$ d) $y^2 = -12x$

8. If $y = \cos x^3$ find $\frac{dy}{dx}$

a) $-3\cos x^3$ b) $-3x^2 \cos x^3$ c) $-3x^2 \sin x^3$ d) $3x^2 \sin x^3$

9. Evaluate: $\int \frac{1}{7x+8} dx$

a) $\log(7x + 8) + C$ b) $\frac{\log(7x+8)}{7} + C$ c) $7 \log(7x + 8) + C$ d) $\frac{1}{\log(7x+8)} + C$

10. Evaluate: $\int_1^2 x \, dx$

a) 1   b) $\frac{3}{2}$ c) $\frac{1}{2}$ d) $\frac{3}{4}$

II. Match the following: 5 × 1 = 5

11.   A   B

a) If $\begin{bmatrix} 6 & x+2 \\ 2 & 4 \end{bmatrix} = \begin{bmatrix} 6 & 1 \\ 2 & 4 \end{bmatrix}$ then the value of x is   i) $\frac{\sqrt{3}-1}{2\sqrt{2}}$

b) If $nc_4 = nc_5$ then n is   ii)   2

c) The third proportional of 6 and 24 is   iii)   -1

d) $\cos 15°$ is   iv)   9

e) The value of $\lim\limits_{x \to 1} \frac{x^2-1}{x-1}$ is   v) $\frac{\sqrt{3}+1}{2\sqrt{2}}$

                                                          vi)   96

III. Fill in the blanks by choosing appropriate answer from given options :   5 × 1 = 5

$$\left(3e^{3x} + c, \quad 3, \quad 12, \quad \frac{1}{2}, \quad 4, \quad \frac{e^{3x}}{3} + c \right)$$

12. Find x such that $\begin{bmatrix} 3 & x \\ 4 & 7 \end{bmatrix}$ is symmetric.

13. If $5P_r = 60,$ then the value of r is _____

14. The mean proportional of 36 and 4 is _____

15. If the length of the latus rectum of the parabola $y^2 = 8kx$ is 4, then the value of k is _____

16. $\int e^{3x} dx =$ ___

PART-B

Answer any SIX questions. $6 \times 2 = 12$

17. If $\begin{bmatrix} 2 & -1 \\ 3 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 10 \\ 2 \end{bmatrix}$, find x and y

18. In how many ways 3 boys and 4 girls can be arranged in a row so that all the 3 boys sit together?

19. A box contains 8 red marbles, 6 green marbles and 10 pink marbles. One marble is drawn at random from the box. What is the probability that the marble drawn is either red or green?

20. If $a : 3 : 15 = 5 : b : 5$, $find\ the\ values\ of\ a\ and\ b$

21. A banker pays ₹2380 on a bill of ₹2500, 73 days before the legal due date. Find the rate of discount charged by the banker.

22. Find the equation of the parabola whose vertex is $(0, 0)$ and focus is $(3, 0)$

23. If $f(x) = x^n\ and\ f'(1) = 10.\ Find\ the\ value\ of\ n$

24. If $s = t^3 - 6t^2 + 9t + 8.$ Find the initial velocity

25. Evaluate: $\int_{-\pi/4}^{\pi/4} \sec^2 x\ dx$

PART-C

V. **Answer any SIX questions.** $6 \times 3 = 18$

26. Solve using Crammer's rule: $3x + 4y = 7$, $7x - y = 6$

27. A man has 10 relatives, 4 of them are ladies, 3 gentlemen and 3 children. In how many ways can he invite 7 relatives to a dinner party so that there are exactly 2 gentlemen and atleast 3 ladies.

28. In a fort, there was ration for 560 soldiers that would last the soldiers for 70 days. After 20 days, 60 soldiers left the fort. For how many days the remaining ration can support the remaining soldiers?

29. Banker's gain on a bill due after 6 months at 4% p.a. is **₹24**. Find TD, BD and bill amount

30. Sanjana invests ₹3240 in a stock at 108 and sells when the price falls to 104. How much stock at 130 can Sanjana buy now?

31. Sanju goes to a shop to buy a bicycle at ₹2,000. The rate of sales tax is 12% on it. He asks the shopkeeper for a rebate on the price of the bicycle to such an extent that he has to pay ₹2016 inclusive of sales tax. Find the rebate.

32. The surface area of a spherical bubble is increasing at the rate of $0.6 cm^2/sec$. Find the rate at which its volume is increasing when its radius is 3cm

33. Evaluate: $\int x \sin x\ dx$

34. Evaluate: $\int_0^1 (6x + 1)\sqrt{3x^2 + x + 5}\ dx$

PART-D

VI. Answer any FOUR questions. $4 \times 5 = 20$

35. Solve by matrix method: $3x + y + 2z = 3, \quad 2x - 3y - z = -3, \quad x + 2y + z = 4$

36. Resolve into partial fraction: $\dfrac{3x+2}{(x-2)(x+3)^2}$

37. Examine whether the propositions $p \leftrightarrow q$ and $[(p \rightarrow q) \wedge (q \rightarrow p)]$ are logically equivalent.

38. XYZ Company supplies water tankers to the Government. The first water tanker takes ₹20,000 labour hours. The government auditors suggest that there should be a 90% learning effect rate. The management expects an order of 8 water tankers in the next year. What will be the labour cost if the company will incur at the rate of ₹20 per hour.

39. Maximize: $Z = 6x + 8y \ subject \ to \ the \ constraints$
$4x + 2y \leq 20, \quad 2x + 5y \leq 24, \qquad x, y \geq 0$

40. If $A + B + C = 180^0$, Prove that: $\sin 2A + \sin 2B + \sin 2C = 4 \sin A \sin B \sin C$

41. If $y = \left(x + \sqrt{a^2 + x^2}\right)^n Prove \ that : (a^2 + x^2)y_2 + xy_1 - n^2y = 0$

PART-E

VII. Answer the following questions.

42. P.T: $\lim\limits_{x \to a} \left(\dfrac{x^n - a^n}{x - a}\right) = na^{n-1}$, for all rational values of n   **(6 marks)**

(OR)

Show that the points $(2, -4), (3, -1), (3, -3) \ and \ (0, 0) \ are \ concyclic.$

43. Two towers of heights 14m and 25m stand on level ground. The angles of elevation of their tops from a point on the line joining their feet are 45^0 and 60^0 respectively. Find the distance between the towers.   **(4 marks)**

(OR)

Find the value of $(1.1)^5$ using Binomial theorem, upto 5 decimal places.