

Gujarat Board

QUESTION PAPER

Gujarat Secondary and Higher Secondary Education Board Previous Year Question Papers

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This Question Paper contains 20 printed pages.
(Part - A & Part - B)

Sl.No.

050 (E)

(JUNE, 2024)
(SCIENCE STREAM)
(CLASS - XII)

પ્રશ્ન પેપરનો સેટ નંબર જેની સામેનું વર્તુળ OMR શીટમાં ઘટ્ટ કરવાનું રહે છે.
Set No. of Question Paper, circle against which is to be darken in OMR sheet.
09

Part - A : Time : 1 Hour / Marks : 50
Part - B : Time : 2 Hours / Marks : 50

(Part - A)

Time : 1 Hour] *[Maximum Marks : 50*

Instructions :

1) **There are 50 objective type (M.C.Q.) questions in Part - A and all questions are compulsory.**
2) **The questions are serially numbered from 1 to 50 and each carries 1 mark.**
3) **Read each question carefully, select proper alternative and answer in the OMR sheet.**
4) **The OMR sheet is given for answering the questions. The answer of each question is represented by (A) O, (B) O, (C) O and (D) O. Darken the circle ● of the correct answer with ball-pen.**
5) **Rough work is to be done in the space provided for this purpose in the Test Booklet only.**
6) **Set No. of Question Paper printed on the upper- most right side of the Question Paper is to be written in the column provided in the OMR sheet.**
7) **Use of simple calculator and log table are allowed, if required.**
8) **Notations used in this question paper have proper meaning.**

1) The number of arbitrary constants in the general solution of a differential equation of fourth order are _____.

(A) 2

(B) 0

(C) 3

(D) 4

Rough Work

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Rough Work

2) For the differential equation $y \log y\, dx - x\, dy = 0$, the general solution is _____.

(A) $y = e^{cx}$ (B) $x = e^{-cy}$

(C) $y = e^{-cx}$ (D) $x = e^{cy}$

3) The homogeneous differential equation

$\left(1 + e^{x/y}\right)dx + e^{x/y}\left(1 - \frac{x}{y}\right)dy = 0$ can be solved by taking the substitution _____.

(A) $v = yx$ (B) $y = vx$

(C) $x = vy$ (D) $x = v$

4) Find angle θ between the vectors $\vec{a} = \hat{i} + \hat{j} - \hat{k}$ and $\vec{b} = \hat{i} - \hat{j} + \hat{k}$.

(A) $\pi - \cos^{-1}\left(\frac{1}{3}\right)$

(B) $\cos^{-1}\left(\frac{1}{3}\right)$

(C) $\pi - \cos^{-1}\left(\frac{2}{3}\right)$

(D) $\cos^{-1}\left(\frac{2}{3}\right)$

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Rough Work

5) Find the area of the parallelogram whose adjacent sides are determined by the vectors $\vec{a} = \hat{i} - \hat{j} + 3\hat{k}$ and $\vec{b} = 2\hat{i} - 7\hat{j} + \hat{k}$.

(A) 15

(B) $15\sqrt{2}$

(C) $\frac{15}{\sqrt{2}}$

(D) 30

6) The value of $\hat{i} \cdot \left(\hat{j} \times \hat{k}\right) + \hat{j} \cdot \left(\hat{i} \times \hat{k}\right) + \hat{k} \cdot \left(\hat{i} \times \hat{j}\right) + \hat{j} \cdot \left(\hat{j} \times \hat{k}\right) =$ _____.

(A) -1

(B) 0

(C) 1

(D) 3

7) Find the direction cosines of the vector $\hat{i} - 2\hat{j} + 3\hat{k}$.

(A) $\frac{-1}{\sqrt{14}}, \frac{-2}{\sqrt{14}}, \frac{-3}{\sqrt{14}}$

(B) $1, -2, 3$

(C) $\frac{1}{\sqrt{14}}, \frac{-2}{\sqrt{14}}, \frac{3}{\sqrt{14}}$

(D) $\frac{1}{14}, \frac{2}{14}, \frac{3}{14}$

8) Find a vector of magnitude 5 units and parallel to the resultant of the vectors $\vec{a} = 2\hat{i} + 3\hat{j} - \hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + \hat{k}$.

(A) $\frac{3\sqrt{10}}{2}\hat{i} - \frac{10\sqrt{2}}{2}\hat{j}$

(B) $\frac{5}{\sqrt{51}}\hat{i} - \frac{5}{\sqrt{51}}\hat{j} - \frac{35}{\sqrt{51}}\hat{k}$

(C) $\frac{3\sqrt{10}}{2}\hat{i} + \frac{10\sqrt{2}}{2}\hat{j} + \frac{\sqrt{2}}{2}\hat{k}$

(D) $\frac{3\sqrt{10}}{2}\hat{i} + \frac{\sqrt{10}}{2}\hat{j}$

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Rough Work

9) $(\vec{a}+\vec{b})\cdot(\vec{a}+\vec{b}) = |\vec{a}|^2 + |\vec{b}|^2$ if and only if _____,

$(\vec{a} \neq \vec{0}, \vec{b} \neq \vec{0})$.

(A) $\vec{a}, \vec{b}$ are perpendicular

(B) $\vec{a}, \vec{b}$ are in same direction

(C) $\vec{a}, \vec{b}$ are in opposite direction

(D) $\vec{a}, \vec{b}$ are neither parallel nor perpendicular

10) If the lines $\frac{1-x}{3} = \frac{7y-14}{2p} = \frac{z-3}{2}$ and $\frac{7-7x}{3p} = \frac{y-5}{1} = \frac{6-z}{5}$ are at right angle then the value of p = _____.

(A) $\frac{70}{11}$

(B) 70

(C) $-\frac{70}{11}$

(D) -70

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

(A) $\frac{x+5}{3} = \frac{y+2}{2} = \frac{z-4}{-8}$

(B) $\frac{x-5}{3} = \frac{y-2}{2} = \frac{z+4}{-8}$

(C) $\frac{x-5}{3} = \frac{y-2}{2} = \frac{z-4}{-8}$

(D) $\frac{x-5}{-3} = \frac{y-2}{-2} = \frac{z+4}{-8}$

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12) Find the angle between the pair of lines $\frac{x}{2}=\frac{y}{2}=\frac{z}{1}$ and $\frac{x-5}{4}=\frac{y-2}{1}=\frac{z-3}{8}$.

(A) $\pi-\cos^{-1}\left(\frac{2}{3}\right)$

(B) $\cos^{-1}\left(\frac{2}{3}\right)$

(C) $-\cos^{-1}\left(\frac{2}{3}\right)$

(D) $\sin^{-1}\left(\frac{2}{3}\right)$

13) For linear programming problem the objective function $Z = 3x + 9y$, if the corner points of the feasible region are $(0, 10), (5, 5), (15, 15)$ and $(0, 20)$, then the maximum value of Z is _____.

(A) 90

(B) 60

(C) 0

(D) 180

14) The solution of the linear programming problem, minimize $Z = 3x + 4y$, subject to the constraints $x + y \leq 4, x \geq 0, y \geq 0$ is _____

(A) 16

(B) 12

(C) 28

(D) 0

15) If $2P(A)=P(B)=\frac{5}{13}$ and $P(A/B)=\frac{2}{5}$ then $P(A\cup B)=$ _____.

(A) $\frac{10}{13}$

(B) $\frac{11}{13}$

(C) $\frac{11}{26}$

(D) $\frac{10}{26}$

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Rough Work

16) If A and B are any two events such that

$P(A) + P(B) - P(A \text{ and } B) = P(A)$, then _____.

(A) $P(A/B) = 1$ (B) $P(B/A) = 1$

(C) $P(B/A) = 0$ (D) $P(A/B) = 0$

17) The relation R in the set R of real numbers, defined as $R = \{(a,b) : a < b\}$ is _____.

(A) transitive but neither reflexive nor symmetric

(B) symmetric but neither reflexive nor transitive

(C) reflexive and symmetric but not transitive

(D) reflexive and transitive but not symmetric

18) The function $f : N \to N$, defined by $f(x) = \begin{cases} x+1, \text{if } x \text{ is odd} \\ x-1, \text{if } x \text{ is even} \end{cases}$

is _____.

(A) many-one and onto

(B) one-one and onto

(C) one-one but not onto

(D) neither one-one nor onto

19) A function $f : R \to R$, $f(x) = 4x + 3$, $f^{-1}(x) =$ _____.

(A) $\frac{x-4}{3}$ (B) $\frac{x+4}{3}$

(C) $\frac{x+3}{4}$ (D) $\frac{x-3}{4}$

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Rough Work

20) $\tan^{-1}\left(-\sqrt{3}\right)-\sec^{-1}(-2)=$ _____.

(A) π

(B) $-\frac{2\pi}{3}$

(C) $-\pi$

(D) $\frac{2\pi}{3}$

21) $\sin\left(\tan^{-1}x\right), |x|<1=$ _____.

(A) $\frac{1}{\sqrt{1-x^2}}$

(B) $\frac{x}{\sqrt{1-x^2}}$

(C) $\frac{1}{\sqrt{1+x^2}}$

(D) $\frac{x}{\sqrt{1+x^2}}$

22) Write the simplest form of $\cot^{-1}\left(\frac{1}{\sqrt{x^2-1}}\right), x>1$.

(A) $-\sec^{-1}x$

(B) $\sec^{-1}x$

(C) $\operatorname{cosec}^{-1}x$

(D) $-\operatorname{cosec}^{-1}x$

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23) $\cos^{-1}\left(\cos\frac{13\pi}{6}\right)+\tan^{-1}\left(\tan\frac{7\pi}{6}\right)=$ _____.

(A) $\frac{\pi}{3}$ (B) π

(C) $\frac{\pi}{6}$ (D) 0

24) If A is a matrix of order $m\times n$ and B is a matrix such that AB′ and B′A are both defined, then order of matrix B is _____.

(A) $n\times n$ (B) $m\times m$

(C) $n\times m$ (D) $m\times n$

25) For any two matrices A and B of order 3×3, we have _____.

(A) $AB\neq BA$

(B) $AB=BA$

(C) $AB=O$

(D) $AB=I$

26) If $A=\begin{bmatrix}\alpha & \beta\\ \gamma & -\alpha\end{bmatrix}$ is such that $A^2=I$, then _____.

(A) $1-\alpha^2+\beta\gamma=0$

(B) $1+\alpha^2+\beta\gamma=0$

(C) $1-\alpha^2-\beta\gamma=0$

(D) $1+\alpha^2-\beta\gamma=0$

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27) If A and B are skew symmetric matrices of the same order, then $(AB)' =$ _____.

(A) $A'B'$

(B) BA

(C) $-A'B'$

(D) $-BA$

28) If A is an invertible matrix of order 2, then determinant of A^{-1} is _____

(A) $\frac{1}{\det(A)}$

(B) $\det(A)$

(C) 1

(D) 0

29) If area of triangle is 35 sq. units with vertices (2, –6), (5, 4) and $(k, 4)$, then k is _____.

(A) –2

(B) 12

(C) –12, –2

(D) 12, –2

30) For a matrix $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 4 \end{bmatrix}$, $(A^{-1})^2 =$ _____.

(A) $\begin{bmatrix} -4 & 0 & 0 \\ 0 & -9 & 0 \\ 0 & 0 & -16 \end{bmatrix}$

(B) $\begin{bmatrix} 4 & 0 & 0 \\ 0 & 9 & 0 \\ 0 & 0 & 16 \end{bmatrix}$

(C) $\begin{bmatrix} \frac{1}{4} & 0 & 0 \\ 0 & \frac{1}{9} & 0 \\ 0 & 0 & \frac{1}{16} \end{bmatrix}$

(D) $\begin{bmatrix} -\frac{1}{4} & 0 & 0 \\ 0 & -\frac{1}{9} & 0 \\ 0 & 0 & -\frac{1}{16} \end{bmatrix}$

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31) If A and B are matrices of order 3×3 and $|A| = 5$, $|B| = 3$, then $|3AB| =$ _____.

(A) 15 (B) 45

(C) 135 (D) 405

32) If $x = \sin y$, then $\frac{d^2y}{dx^2} =$ _____, $(0 < x < 1)$.

(A) $\frac{-x}{(1-x^2)^{3/2}}$ (B) $\frac{1}{(1-x^2)^{3/2}}$

(C) $\frac{x}{(1-x^2)^{3/2}}$ (D) $\frac{-1}{(1-x^2)^{3/2}}$

33) For $xy = e^{x-y}$, $\frac{dy}{dx} =$ _____

(A) $\frac{y(x-1)}{x(y+1)}$ (B) $\frac{x(y+1)}{y(x-1)}$

(C) $\frac{y(y+1)}{x(x-1)}$ (D) $\frac{y(x+1)}{x(y-1)}$

34) If $x = at^2$, $y = 2at$, then $\frac{dy}{dx} =$ _____.

(A) $\frac{x}{2y}$ (B) $\frac{x}{y}$

(C) $\frac{y}{2x}$ (D) $\frac{y}{x}$

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35) The radius of a circle is increasing at the rate of 0.7 cm/s. What is the rate of increase of its circumference?

(A) 14π cm/s

(B) 1.4π cm/s

(C) 0.14π cm/s

(D) -1.4π cm/s

36) Function $y = 6 - 9x - x^2$ is strictly increasing in the interval _____.

(A) $\left(-\infty, \frac{9}{2}\right)$

(B) $\left(0, -\frac{9}{2}\right)$

(C) $(-\infty, 0)$

(D) $\left(-\infty, -\frac{9}{2}\right)$

37) What is the maximum value of the function $\sin x + \cos x$?

(A) $\sqrt{2}$

(B) 1

(C) 2

(D) 0

38) The point is on the curve $x^2 = 2y$ which is nearest to the point (0, 5) is _____.

(A) $\left(2\sqrt{2}, 0\right)$

(B) $\left(2\sqrt{2}, 4\right)$

(C) (0, 0)

(D) (2, 2)

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39) If $\frac{d}{dx}(f(x)) = 4x^3 - \frac{3}{x^4}$ such that $f(2) = 0$, then $f(x)$ is _____.

(A) $x^3 + \frac{1}{x^4} + \frac{129}{8}$

(B) $x^4 + \frac{1}{x^3} - \frac{129}{8}$

(C) $x^4 + \frac{1}{x^3} + \frac{129}{8}$

(D) $x^3 + \frac{1}{x^4} - \frac{129}{8}$

40) $\int \frac{\sin(\tan^{-1} x)}{1+x^2} dx =$ _____ + C.

(A) $-\sin(\tan^{-1} x)$

(B) $\sin(\tan^{-1} x)$

(C) $-\cos(\tan^{-1} x)$

(D) $\cos(\tan^{-1} x)$

41) $\int \frac{x}{\sqrt{x+4}} dx,\ x > -4 =$ _____ + C.

(A) $\frac{2}{3}\sqrt{x+4}(x-8)$

(B) $-\frac{2}{3}\sqrt{x+4}(x-8)$

(C) $\frac{1}{3}\sqrt{x+4}(x-8)$

(D) $-\frac{1}{3}\sqrt{x+4}(x-8)$

42) $\int \frac{e^x(1+x)}{\sin^2(x \cdot e^x)} dx =$ _____ + C.

(A) $\tan(x \cdot e^x)$

(B) $\cot(x \cdot e^x)$

(C) $-\tan(x \cdot e^x)$

(D) $-\cot(x \cdot e^x)$

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43) $\int e^x \cdot \sec x(1+\tan x)\,dx =$ _____ $+ C$.

(A) $e^x \cdot \sec x$ (B) $e^x \cdot \cos x$

(C) $e^x \cdot \sin x$ (D) $e^x \cdot \tan x$

44) $\int_{\pi/6}^{\pi/2} \frac{dx}{1+\sqrt{\tan x}} =$ _____ $+ C$.

(A) $\frac{\pi}{3}$ (B) $\frac{\pi}{6}$

(C) $\frac{\pi}{12}$ (D) 0

45) $\int \frac{1-\cos x}{1+\cos x}\,dx =$ _____ $+ C$.

(A) $2\tan\frac{x}{2}+x$ (B) $-\tan\frac{x}{2}-x$

(C) $-2\tan\frac{x}{2}-x$ (D) $2\tan\frac{x}{2}-x$

46) $\int \tan^8 x \cdot \sec^4 x\,dx =$ _____ $+ C$.

(A) $\frac{\tan^{11} x}{11}-\frac{\tan^9 x}{9}$ (B) $\frac{\tan^{11} x}{11}+\frac{\tan^9 x}{9}$

(C) $\frac{\tan^9 x}{9}+\frac{\tan^7 x}{7}$ (D) $\frac{\tan^9 x}{9}-\frac{\tan^7 x}{7}$

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Rough Work

47) Find the area bounded by the curve $y = \cos x$ between $x = 0$ and $x = \frac{3\pi}{2}$.

(A) 2

(B) 1

(C) 3

(D) 4

48) Find the area of the region bounded by the ellipse $\frac{x^2}{4} + \frac{y^2}{9} = 1$.

(A) 36π

(B) 6π

(C) 13π

(D) 24π

49) The area bounded by the curve $y = x|x|$, X - axis and the ordinates $x = -1$ and $x = 1$ is given by _____.

(A) $\frac{1}{3}$

(B) 0

(C) $\frac{2}{3}$

(D) $\frac{4}{3}$

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50) The degree of the differential equation

$\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^2 + \sin\left(\frac{dy}{dx}\right) + 1 = 0$ is _____.

(A) 3

(B) 1

(C) 2

(D) not defined

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050 (E)

(JUNE, 2024)
(SCIENCE STREAM)
(CLASS - XII)

(Part - B)

Time : 2 Hours] *[Maximum Marks : 50*

Instructions :

1) Write in a clear legible handwriting.
2) There are three sections in Part - B of the question paper and total 1 to 27 questions are there.
3) All questions are compulsory. Internal options are given.
4) The numbers at right side represent the marks of the question.
5) Start new section on new page.
6) Maintain sequence.
7) Use of simple calculator and log table is allowed, if required.
8) Use the graph paper to solve the problem of L.P.

SECTION - A

■ **Answer any 8 questions from the questions given below from 1 to 12. (Each question carries 2 marks.)** **[16]**

1) Prove that : $3\cos^{-1}x = \cos^{-1}\left(4x^3 - 3x\right);\ x \in \left[\frac{1}{2}, 1\right]$. **[2]**

2) Prove that : $\tan^{-1}\sqrt{x} = \frac{1}{2}\cos^{-1}\left[\frac{1-x}{1+x}\right];\ x \in [0,1]$. **[2]**

3) If the function $f(x) = \begin{cases} \frac{k\cos x}{\pi - 2x}, & \text{if } x \neq \frac{\pi}{2} \\ 3, & \text{if } x = \frac{\pi}{2} \end{cases}$ is continuous at $x = \frac{\pi}{2}$, then find the value of k. **[2]**

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4) Find $\int \frac{dx}{e^x - 1}$. [2]

5) Sketch the graph of $y = |x + 3|$ and evaluate $\int_{-6}^{0} |x+3| dx$. [2]

6) Find the area of the region bounded by the line $y = 3x + 2$, the X - axis and the ordinates $x = -1$ and $x = 1$. [2]

7) Find the solution of the differential equation [2]

$$x\frac{dy}{dx} + 2y = x^2 \log x$$

8) If $\vec{a}, \vec{b}, \vec{c}$ are unit vectors such that $\vec{a} + \vec{b} + \vec{c} = \vec{0}$, find the value of $\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a}$. [2]

9) Find the vector equation of the line passing through the point (1, 2, –4) and perpendicular to the two lines : [2]

$$\frac{x-8}{3} = \frac{y+19}{-16} = \frac{z-10}{7} \text{ and } \frac{x-15}{3} = \frac{y-29}{8} = \frac{z-5}{-5}$$

10) Show that the line through the points (4, 7, 8), (2, 3, 4) is parallel to the line through the points (–1, –2, 1), (1, 2, 5). [2]

11) Given that the two numbers appearing on throwing two dice are different. Find the probability of the event 'the sum of numbers on the dice is 4'. [2]

12) Probability of solving specific problem independently by A and B are $\frac{1}{2}$ and $\frac{1}{3}$ respectively. If both try to solve the problem independently, find the probability that exactly one of them solves the problem. [2]

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SECTION - B

Answer any 6 questions from the questions given below from 13 to 21. (Each question carries 3 marks.) **[18]**

13) Let A = R – {3} and B = R – {1}. Consider the function $f : A \to B$ defined by $f(x) = \left(\frac{x-2}{x-3}\right)$. Is f one-one and onto? Justify your answer. **[3]**

14) Express the matrix $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ as the sum of a symmetric and a skew symmetric matrices. **[3]**

15) If $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$, then verify that $A \cdot \text{adj } A = |A| \cdot I$. Also find A^{-1}. **[3]**

16) If $x = a\left(\cos t + \log \tan \frac{t}{2}\right), y = a \sin t$ then find $\frac{d^2y}{dx^2}$. **[3]**

17) Prove that $y = \frac{4 \sin \theta}{(2 + \cos \theta)} - \theta$ is an increasing function of θ in $\left[0, \frac{\pi}{2}\right]$. **[3]**

18) If with reference to the right handed system of mutually perpendicular unit vectors $\hat{i}, \hat{j}$ and $\hat{k}$, $\vec{\alpha} = 3\hat{i} - \hat{j}, \vec{\beta} = 2\hat{i} + \hat{j} - 3\hat{k}$, then express $\vec{\beta}$ in the form $\vec{\beta} = \vec{\beta}_1 + \vec{\beta}_2$, where $\vec{\beta}_1$ is parallel to $\vec{\alpha}$ and $\vec{\beta}_2$ is perpendicular to $\vec{\alpha}$. **[3]**

19) Find the shortest distance between the lines l_1 and l_2 whose vector equations are

$\vec{r} = \hat{i} + \hat{j} + \lambda\left(2\hat{i} - \hat{j} + \hat{k}\right)$

$\vec{r} = 2\hat{i} + \hat{j} - \hat{k} + \mu\left(3\hat{i} - 5\hat{j} + 2\hat{k}\right)$. **[3]**

20) Solve the following Linear Programming problem graphically : **[3]**

Minimize $Z = 200x + 500y$

Subject to constraints

$x + 2y \geq 10$

$3x + 4y \leq 24$

$x \geq 0, y \geq 0$

21) A bag contains 4 red and 4 black balls, another bag contains 2 red and 6 black balls. One of the two bags is selected at random and a ball is drawn from the bag which is found to be red. Find the probability that the ball is drawn from the first bag. **[3]**

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SECTION - C

■ **Answer any 4 questions from the questions given below from 22 to 27 (Each question carries 4 marks.)** [16]

22) If $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$, prove that $A^3 - 6A^2 + 7A + 2I = O$ and deduce A^{-1}. [4]

23) Solve the following system of equations by matrix method [4]

$$x + y + z = 6$$
$$y + 3z = 11$$
$$x + z = 2y$$

24) If $y = e^{a\cos^{-1}x}, -1 \le x \le 1$, show that $(1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} - a^2y = 0$. [4]

25) Show that of all the rectangles inscribed in a given fixed circle, the square has the maximum area. [4]

26) Evaluate : $\int_0^{\pi/4} \log(1 + \tan x)\, dx$. [4]

27) In a culture, the bacteria count is 1,00,000. The number is increased by 10% in 2 hours. In how many hours will the count reach 2,00,000, if the rate of growth of bacteria is proportional to the number present? [4]

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