SAMPLE QUESTION PAPER - 2025-26
CLASS XII - MATHEMATICS (041)

Time Allowed: 3 Hours **Maximum Marks: 80**

ANSWER KEY

SECTION A (20 Marks)

Multiple Choice Questions (MCQs)

1. (b) Transitive but not Symmetric
2. (a) 0
3. (c) $\frac{x+2}{3}$
4. (c) $-\frac{\pi}{3}$
5. (b) 2
6. (b) Zero matrix
7. (a) 4
8. (b) $\frac{1}{\det(A)}$
9. (b) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$
10. (c) $\pm 2\sqrt{2}$
11. (d) 0
12. (b) $\frac{1}{2}\cot x$
13. (c) $\frac{1}{x}$
14. (a) 0
15. (a) Order 3, Degree 2
16. (a) $-\frac{1}{e}$
17. (a) $\frac{2}{3}$
18. (a) 4 units
19. (a) 0.4

Assertion-Reasoning Based Question

20. (a) Both A and R are true and R is the correct explanation of A.

SECTION B (10 Marks)

Questions 21-25

21. $k = 1$
22. $|\vec{x}| = 3$
    OR
    Direction cosines: $\left(\frac{2}{\sqrt{17}}, \frac{2}{\sqrt{17}}, \frac{3}{\sqrt{17}}\right)$
23. $\frac{1}{2}\tan^{-1}\left(\frac{x-3}{2}\right) + C$
    OR
    $\frac{\pi}{4}$
24. $A = \begin{bmatrix} e^3 & e^4 \\ e^5 & e^6 \end{bmatrix}$

25. $\frac{1}{2}$

SECTION C (18 Marks)

Questions 26-31

1. $f^{-1}(x) = \frac{3x+1}{2}$
2. $y = -x + 1$
   OR
   Marginal revenue = 66 Rupees
3. $\tan y = C(1 - e^x)$
   OR
   $\log|1 + y| = x + \frac{x^2}{2} - \frac{3}{2}$
4. Vector equation: $\vec{r} = (\hat{i} + 2\hat{j} - 4\hat{k}) + \lambda(2\hat{i} + 3\hat{j} - 5\hat{k})$
   Cartesian equation: $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z+4}{-5}$
5. $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$ (Proof)
   OR
   $A^2 - 5A + 7I = 0$ (Proof)
6. Maximum value of $Z = 16$ at $(0, 4)$

SECTION D (20 Marks)

Questions 33-36

1. $8\sqrt{3}$ square units
   OR
   $\frac{4(3\pi-8)}{3}$ square units
2. $x = 1$, $y = 2$, $z = 3$
3. Height of cylinder = $\frac{2R}{\sqrt{3}}$ (Proof)
   OR
   $\log(2 + \sqrt{3}) - \log(\sqrt{3})$ or $\log\left(\frac{2+\sqrt{3}}{\sqrt{3}}\right)$
4. $\frac{1}{\sqrt{6}}$ units

SECTION E (12 Marks)

Case Study Based Questions 37-39

1. **Case Study 1: Navigation and Vector Algebra**
   (a) $\vec{OB} = -\hat{i} + 5\hat{j} + 8\hat{k}$
   (b) $\vec{AB} = -3\hat{i} + \hat{j} + 5\hat{k}$
   (c) $\frac{42}{\sqrt{29}}$
   OR
   $17\hat{i} - 19\hat{j} + 14\hat{k}$ (or any scalar multiple)
2. **Case Study 2: Disease Testing and Bayes' Theorem**
   (a) 0.82 or $\frac{41}{50}$
   (b) $\frac{9}{17}$
   OR
   $\frac{1}{33}$
3. **Case Study 3: Rate of Change and Optimization**

(a) $r = \frac{h}{2}$

(b) $\frac{1}{2\pi}$ m/min
OR
$\frac{2}{\pi}$ m/min