D.A.V. PUBLIC SCHOOL, NEW PANVEL

I UNIT TEST(SAMPLE PAPER)

2025-2026

Std:-XII

Sub:- Applied Mathematics **Time:- 2 Hours**

Date :- **Max. Marks:- 50**

General Instructions :

1. This Question paper contains - **five sections** A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.
2. **Section A** has 10 **MCQ's and 02** Assertion-Reason based questions of 1 mark each.
3. **Section B** has 4 **Very Short Answer** (VSA)-type questions of 2 marks each.
4. **Section C** has 4 **Short Answer** (SA)-type questions of 3 marks each.
5. **Section D** has 2 **Long Answer** (LA)-type questions of 5 marks each.
6. **Section E** has 2 **source based/case based/passage based/integrated units of assessment** (4 marks each) with sub parts.

SECTION – A

This section comprises multiple choice questions (MCQs) of 1 mark each

1. If $\begin{bmatrix} 7 & 7y-13 \\ y & x+6 \end{bmatrix} = \begin{bmatrix} 2x+y & 4x \\ 5x-7 & 4x \end{bmatrix}$, then x+y is

   (a) 5 (b) 6 (c) 9 (d) -2

2. The derivative of a^{2x+3} w.r.t x is

   (a) $2\, a^{2x+3}\log a$ (b) $a^{2x+3}\log a$ (c) a^{2x+3} (d) $2a^{2x+3}$

3. Which among the following statement is true?
   (a)A determinant exists for all matrices
   (b) The minor of an element is a matrix
   (c) Adjoint of a matrix is the transpose of a cofactor matrix
   (d)Every matrix have an inverse matrix

4. The matrix of order 2x3 obtained under the condition $a_{ij} = \frac{2i-j}{4}$ is

   (a) $\begin{bmatrix} \frac{1}{4} & \frac{1}{4} & -\frac{1}{2} \\ \frac{3}{2} & \frac{1}{2} & \frac{1}{4} \end{bmatrix}$ (b) $\begin{bmatrix} \frac{1}{4} & 0 & -\frac{1}{4} \\ \frac{3}{4} & \frac{1}{2} & \frac{1}{4} \end{bmatrix}$ (c) $\begin{bmatrix} -\frac{1}{4} & 0 & -\frac{1}{2} \\ \frac{3}{2} & \frac{1}{2} & \frac{1}{4} \end{bmatrix}$ (d)$none\ of\ these$

5. The value of $\int_1^e (\log x)^2\, dx$ is

   (a) e (b) 2 (c) $e-2$ (d) $e-1$

6. If $A = \begin{bmatrix} 5 & 2 \\ 4 & -2 \end{bmatrix}$, then the value of $|3A^{-1}|$ is

   (a) 2 (b) $\frac{1}{2}$ (c) $-\frac{1}{2}$ (d) -2

7. The demand function of a monopolist is given by x=100-4p. The quantity at which

marginal revenue = 0 will be

(a) 25 (b) 10 (c) 50 (d)40

8. For the curve $\sqrt{x}+\sqrt{y}=1$, find $\frac{dy}{dx}$ at $\left(\frac{1}{4},\frac{1}{4}\right)$

(a) $\frac{1}{2}$ (b) 1 (c) -1 (d) 2

9. The value of $M_{23}+M_{13}+M_{32}$ from the determinant $\begin{vmatrix} 2 & 1 & 3 \\ -4 & -2 & 1 \\ 3 & 0 & 1 \end{vmatrix}$ is

(a)17 (b)20 (c)23 (d)35

10. The value of x, when the matrix $A=\begin{bmatrix} 1 & 1 & 3 \\ 1 & -2 & x \\ -1 & 1 & -5 \end{bmatrix}$ is singular

(a) 6 (b) 12 (c) $-\frac{25}{13}$ (d) $none\ of\ these$

Questions number **11** and **12** are Assertion-Reason based questions. Two statements are given, one labeled Assertion(A) and the other labeled Reason (R). Select the correct answer from the codes (a), (b), (c) and (d) as given below.

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

(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is **not** the correct explanation of the Assertion (A).

(c) Assertion (A) is true and Reason (R) is false.

(d) Assertion (A) is false and Reason (R) is true.

11. **Assertion (A):** The condition BI= IB is true for any square matrices B and an Identity matrix I.

Reason (R): The product AB of matrix exists if the number of rows in the first matrix A, is equal to the number of columns in the second matrix B.

12. **Assertion (A)** $f(x)=e^x$, is an increasing function, $\forall\ x \in R$.

Reason(R) : If $f'^{(x)} \leq 0$, then $f(x)$ is an increasing function

SECTION B

This section comprises of **4** very short answer type-questions (VSA) of 2 marks each

13. Find the intervals in which the function f(x) = $2x^3$-$3x^2$-36x + 7 is strictly increasing and strictly decreasing **OR**

Evaluate $\int x \log(1+x)\, dx$

14. Find $(A+B)^{-1}$, if $A=\begin{bmatrix} 3 & 4 \\ 2 & 3 \end{bmatrix}$ and $B=\begin{bmatrix} -2 & -2 \\ 0 & -1 \end{bmatrix}$.

15. If $A=\begin{bmatrix} 1 & -2 & 4 \\ 2 & -1 & 3 \\ 4 & 2 & 0 \end{bmatrix}$ is the adjoint of square matrix B, then find B^{-1}

16. If $x=\ t^2, y=\ t^3$, then find the value of $\frac{d^2y}{dx^2}$.

SECTION C

This section comprises of short answer type questions (SA) of 3 marks each

17. Find the sum of values of a, which makes the $\Delta = \begin{vmatrix} 1 & -2 & 5 \\ 2 & a & -1 \\ 0 & 4 & 2a \end{vmatrix} = 86$

18. Find the marginal cost and average cost of the total cost function

$C(x) = 3x^2 - 5x + 1$

19. If $y = e^{ax} cosbx$, then prove that $y_2 - 2ay_1 + (a^2 + b^2)y = 0$

20. Find the matrix A, if $\begin{bmatrix} 2 & -1 \\ 1 & 0 \\ -3 & 4 \end{bmatrix} A = \begin{bmatrix} -1 & -8 & -10 \\ 1 & -2 & -5 \\ 9 & 22 & 15 \end{bmatrix}$

SECTION D

This section comprises 2 of long answer-type questions (LA) of 5 marks each

21. Using Matrix Method, solve the system of equations $\begin{matrix} x - y + z = 4 \\ 2x + y - 3z = 0 \\ x + y + z = 2 \end{matrix}$

OR

If $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$ and $A^3 - 6A^2 + 7A + kI = 0$, find the value of 'k'?

22. A wire of length 34m is to be cut into two pieces. One of the pieces is to be made into square and other into a rectangle, whose length is twice its breadth. What should be the length of two pieces, so that the combined area of square and rectangle is minimum?

SECTION E

This section comprises of **2** case-study/passage-based questions of 4 mark each

23. **Case Study 1:** To control a crop disease, it is necessary to use 8 units of chemical A, 14 units of chemical B and 13 units of chemical C. One barrel of spray P contains 1 unit of A, 2 units of B and 3 units of C. One barrel of spray Q contains 2 units of A, 3 units of B and 2 units of C. One barrel of R contains 1 unit of A, 2 units of B and 2units of C.Based on the above information answer the following questions:

(i) Express the statement in matrix fom? 1
(ii) Is the coefficient matrix singular? 1
(iii) (a) How many barrels of spray P are used to just meet the requirement?. 2

OR

(iii) (b) How many barrels of spray R are used to meet the requirement? 2

24. **Case-Study 2**: Read the following passage and answer the questions given below.

A telephone company in a town has 500 subscribers on its list and collects fixed charges of 300 per subscriber per year. The company proposes to increase the annual subscription and it is believed that for every increase of 1 one subscriber will discontinue the service.

On the basis of above information answer the following questions.

(i)If x be the annual subscription then the total revenue of the company after increment

(ii)How much fee the company should increase to have maximum profit?

(iii)Find the maximum profit that the company can make if the profit function is given by $P(x) = 41 + 24x – 18x^2$.

OR

Find both the maximum and minimum values respectively of $3x^4 – 8x^3 + 48x + 1$ on the interval [1, 4].

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