

## UNIT TEST

Duration: 1 hour

Marks: 30

### SECTION A

Each carry 1 mark

1. If  $A = \begin{bmatrix} a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}$ , then  $\det(\text{adj}A)$  is

- (a)  $a^{27}$       (b)  $a^9$       (c)  $a^6$       (d)  $a^2$

2. If  $A$  is non-singular square matrix of order 3 such that  $A^2 = 3A$ , then the value of  $|A|$  is

- (a) -3      (b) 3      (c) 9      (d) 27

3. If  $A$  is a square matrix such that  $A^2 = I$ , then  $A^{-1}$  is

- (a)  $2A$       (b)  $O$       (c)  $A$       (d)  $A + I$

4. Assertion: The minor of the element  $a_{32}$  of the determinant  $\begin{vmatrix} 9 & 2 & 3 \\ 2 & 0 & 1 \\ 5 & 3 & 8 \end{vmatrix}$  is 3.

Reason: The minor of an element  $a_{ij}$  of a determinant is defined as the value of determinant obtained after deleting the  $i^{\text{th}}$  row and  $j^{\text{th}}$  column.

- (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
- (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
- (c) Assertion (A) is true but Reason (R) is false.
- (d) Assertion (A) is false but Reason (R) is true.

### SECTION B

Each carry 2 marks

5. Find the value of  $x$  if  $\begin{vmatrix} x^2 & x & 1 \\ 0 & 2 & 1 \\ 3 & 1 & 4 \end{vmatrix} = 28$

6. If  $A = \begin{bmatrix} p & 2 \\ 2 & p \end{bmatrix}$  and  $|A^3| = 125$ , then find the values of  $p$ .

7. If  $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$  be such that  $A^{-1} = kA$ , then find the value of  $k$ .

### SECTION C

**Each carry 3 marks**

8. Swathi wants to donate a rectangular plot of land for a school in her village. When she was asked to give dimensions of the plot, she told that if its length is decreased by 50m and breadth is increased by 50m then its area will remain the same. But if the length is decreased by 10m and breadth is decreased by 20m, then its area will be decreased by  $5300\text{m}^2$ . Using matrices, find the dimensions of the plot.

9. Show that  $A = \begin{bmatrix} 5 & 3 \\ -1 & -2 \end{bmatrix}$  satisfies the equation  $x^2 - 3x - 7 = 0$  and hence find  $A^{-1}$ .

### SECTION D

**Each carry 5 marks**

10. If  $A = \begin{bmatrix} 2 & -3 & 5 \\ 3 & 2 & -4 \\ 1 & 1 & -2 \end{bmatrix}$ , find  $A^{-1}$  and hence solve the system of equations:  $2x - 3y + 5z = 11$ ,

$3x + 2y - 4z = -5$  and  $x + y - 2z = -3$ .

11. Determine the product  $\begin{bmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{bmatrix} \begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & -2 \\ 2 & 1 & 3 \end{bmatrix}$  and use it to solve the system of

equations:  $x - y + z = 4$ ,  $x - 2y - 2z = 9$  and  $2x + y + 3z = 1$ .

### SECTION E

12. Two schools A and B decided to award prizes to their students for three games: hockey ( $x$ ), cricket ( $y$ ) and tennis ( $z$ ). School A decided to award a total of ₹11000 for the three games to 5, 4

and 3 students respectively, while school B decided to award ₹10700 for the three games to 4, 3 and 5 students respectively. Also, the three prizes together amount to ₹2700.

Using the information given above answer the following:

- (i) Represent the above situation using matrix equation.
- (ii) Find out the prize amount for hockey, cricket and tennis.

Answers

1. (c)  $a^6$

2. (d) 27

3. (c) A

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

5.  $2, -\frac{17}{7}$

6.  $\pm 3$

7.  $k = \frac{1}{19}$

8. 200m and 150m.

9.  $\frac{1}{7} \begin{bmatrix} 2 & 3 \\ -1 & -5 \end{bmatrix}$

10.  $A^{-1} = \begin{bmatrix} 0 & 1 & -2 \\ -2 & 9 & -23 \\ -1 & 5 & -13 \end{bmatrix}$  and  $x = 1, y = 2, z = 3$ .

11.  $AB = \begin{bmatrix} 8 & 0 & 0 \\ 0 & 8 & 0 \\ 0 & 0 & 8 \end{bmatrix}, x = 3, y = -2, z = -1$

12. (i)  $\begin{bmatrix} 5 & 4 & 3 \\ 4 & 3 & 5 \\ x & y & z \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 11000 \\ 10700 \\ 2700 \end{bmatrix}$  (ii) Amount of hockey = ₹1000, amount of cricket = ₹900 and amount of tennis = ₹800