**SAI TUTORIALS**

Date :- 29.05.23 Marks : - 25

Time :- 1 HR Sub: Maths & Stat part-1(Chp-1,2) Std : -XII com

Q.1 Select and write the correct answer from the given alternatives in each of the following questions : [2]

**(i)** If $A^{-1} = \frac{1}{2}\begin{bmatrix} 4 & 3 \\ 2 & 2 \end{bmatrix}$, then A =

(a) $\begin{bmatrix} 2 & 3 \\ -2 & 4 \end{bmatrix}$ (b) $\begin{bmatrix} -2 & 3 \\ 2 & -4 \end{bmatrix}$

(c) $\begin{bmatrix} 2 & -3 \\ -2 & 4 \end{bmatrix}$ (d) $\begin{bmatrix} -2 & 3 \\ 4 & -2 \end{bmatrix}$

**(ii)** If $p$ : 4 is an even prime number

$q$ : 6 is a divisor of 12

$r$ : HCF of 4 and 6 is 2, then which of the following is true ?

(a) $p \wedge q$ (b) $(p \vee q) \wedge (\sim r)$

(c) $\sim (q \wedge r) \vee p$ (d) $\sim p \vee (q \wedge r)$

Q.2 State whether the following statements are True or False : [2]

**(i)** If $p$, $q$ are true statements and $r$ is a false statement, then the truth value of $(p \vee r) \rightarrow (\sim q \wedge s)$ depends on the truth value of $s$.

**(ii)** If $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 4 & 5 \\ 4 & 6 & 8 \end{bmatrix}$, then $A^{-1}$ does not exist.

Q.2 (A) Attempt any two of the following questions [6]

1 Examine whether the statement pattern $(p \rightarrow q) \wedge (p \rightarrow r)$ is a tautology or a contradiction or a contingency.

2 Write the negation of each of the following statements.

i) All men are animals.

ii) – 3 is a natural number.

iii) It is false that Nagpur is capital of Maharashtra

3 If $X + Y = \begin{bmatrix} 2 & -1 \\ 1 & 3 \\ -3 & -2 \end{bmatrix}$ and $X - 2Y = \begin{bmatrix} -2 & 1 \\ 3 & -1 \\ 4 & -2 \end{bmatrix}$ then find X, Y.

Q.2 (B) Attempt any two of the following [8]

1 Find the inverse of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 2 & 4 \\ 0 & 0 & 5 \end{bmatrix}$ by adjoint method.

2 Write negation of each of the following statements.

i) All the stars are shining if it is night.

ii) $\forall$ n $\in$ N, $n + 1 > 0$

iii) $\exists$ n $\in$ N, $(n^2 + 2)$ is odd number

iv) Some continuous functions are differentiable.

3 If $A = \begin{bmatrix} 2 & 3 & -1 \\ 4 & 7 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 3 & 2 \\ 4 & 6 & -1 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & -1 & 6 \\ 0 & 2 & -5 \end{bmatrix}$, find the matrix X such that

$3A - 2B + 4X = 5C$.

Q.3 (A) Attempt any one of the following questions [4]

1 Without using truth table, show that

$\sim r \rightarrow \sim (p \wedge q) \equiv [\sim (q \wedge r)] \rightarrow (\sim p)$.

2 If $A = \begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}$, find k, so that $A^2 - kA + 2I = O$, where I is a 2×2 the identity matrix and

Q.3 (B) Attempt any one of the following questions [3]

1 $p \vee (q \vee r) \equiv (p \vee q) \vee (p \vee r)$

| $p$ | $q$ | $r$ | $q \vee r$ | $p \vee (q \vee r)$ | $p \vee q$ | $p \vee r$ | $(p \vee q) \vee (p \vee r)$ |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| T | T | □ | T | □ | T | □ | □ |
| T | T | □ | T | □ | □ | T | □ |
| □ | F | T | □ | T | □ | □ | T |
| □ | F | F | □ | □ | T | T | T |
| F | □ | □ | T | T | □ | □ | □ |
| F | □ | □ | T | T | T | F | T |
| □ | □ | □ | T | □ | F | T | T |
| □ | □ | F | □ | □ | □ | □ | F |

From the truth table 1.16, we observe that all entires in 5th and 8th columns are identical.

$\therefore p \vee (q \vee r) \equiv (p \vee q) \vee (p \vee r)$

2 Express the following equations in matrix form and solve them by the method of reduction

$$x + 3y + 3z = 12, x + 4y + 4z = 15, \quad x + 3y + 4z = 13.$$

**Solution:** The given equations can be write as

$$x + 3y + 3z = 12, x + 4y + 4z = 15, \quad x + 3y + 4z = 13.$$

Hence the matrix equation is AX = B

$$\begin{bmatrix} \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} \cdots \\ \cdots \\ \cdots \end{bmatrix} \qquad \text{(i.e. } \mathbf{AX} = \text{B)}$$

By $R_2 \to R_2 - R_1$ and $R_3 \to R_3 - R_1$ $\begin{bmatrix} 1 & 3 & 3 \\ \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 12 \\ \cdots \\ \cdots \end{bmatrix}$

We write equation as

$x + 3y + 3z = 12$ ----------------------- (1)

$y + z =$ …….. -------------------------- (2)

$z =$ ……… ----------------------------- (3)

from (3) , $z = 1$

Put $z = 1$ in equation (2) $y +$ ……. =…….. $y =$ ……….

Put $y =$ ……… , $z = 1$ in equation (1) $x +$ …… + …….. = ………. , $x =$ …….

$\therefore$ $x =$ ………. , $y =$ ………. , $z = 1$