# MCQs for Final Exam (Math-244: Linear algebra, Semester-2, 1441H)

**Question 1:**

**Model-I:** If AB+A-I=0 where $B=\begin{bmatrix}2 & 3\\ 1 & 4\end{bmatrix}$, then $A^{-1}$ =

(a) $\begin{bmatrix}3 & 3\\ 1 & 5\end{bmatrix}$ (b) $\begin{bmatrix}-3 & -3\\ -1 & -5\end{bmatrix}$ (c) $\begin{bmatrix}1 & 3\\ 1 & 3\end{bmatrix}$ (d) $\begin{bmatrix}-1 & -3\\ -1 & -3\end{bmatrix}$

**Model-II:** If AB-A-I=0 where $B=\begin{bmatrix}2 & 3\\ 1 & 4\end{bmatrix}$, then $A^{-1}$ =

(a). $\begin{bmatrix}3 & 3\\ 1 & 5\end{bmatrix}$ (b). $\begin{bmatrix}-3 & -3\\ -1 & -5\end{bmatrix}$ (c). $\begin{bmatrix}1 & 3\\ 1 & 3\end{bmatrix}$ (d). $\begin{bmatrix}-1 & -3\\ -1 & -3\end{bmatrix}$

**Model=III:** If AB + A + I = 0 where $B=\begin{bmatrix}2 & 3\\ 1 & 4\end{bmatrix}$, then $A^{-1}$ =

(a). $\begin{bmatrix}3 & 3\\ 1 & 5\end{bmatrix}$ (b). $\begin{bmatrix}-3 & -3\\ -1 & -5\end{bmatrix}$ (c). $\begin{bmatrix}1 & 3\\ 1 & 3\end{bmatrix}$ (d). $\begin{bmatrix}-1 & -3\\ -1 & -3\end{bmatrix}$

**Model-IV:** If AB-A+I=0 where $B=\begin{bmatrix}2 & 3\\ 1 & 4\end{bmatrix}$, then $A^{-1}$ =

(a) $\begin{bmatrix}3 & 3\\ 1 & 5\end{bmatrix}$ (b) $\begin{bmatrix}-3 & -3\\ -1 & -5\end{bmatrix}$ (c) $\begin{bmatrix}1 & 3\\ 1 & 3\end{bmatrix}$ (d) $\begin{bmatrix}-1 & -3\\ -1 & -3\end{bmatrix}$

**Model-V:** If AB+2A-I=0 where $B=\begin{bmatrix}2 & 3\\ 1 & 4\end{bmatrix}$, then $A^{-1}$ =

(a) $\begin{bmatrix}4 & 3\\ 1 & 6\end{bmatrix}$ (b) $\begin{bmatrix}-3 & -3\\ -1 & -5\end{bmatrix}$ (c) $\begin{bmatrix}1 & 3\\ 1 & 3\end{bmatrix}$ (d) $\begin{bmatrix}-1 & -3\\ -1 & -3\end{bmatrix}$

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**Question 2:**

**Model-I:** The inverse of $B = \begin{bmatrix} 1 & 0 & 1 \\ 5 & 1 & 4 \\ 0 & 0 & 1 \end{bmatrix}$ is:

(a). $\begin{bmatrix} 1 & 0 & 1 \\ -5 & 1 & 1 \\ 0 & 0 & -1 \end{bmatrix}$ (b). $\begin{bmatrix} 1 & 0 & 1 \\ -5 & 1 & -1 \\ 0 & 0 & 1 \end{bmatrix}$ (c). $\begin{bmatrix} 1 & 0 & -1 \\ -5 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$ (d). $\begin{bmatrix} 1 & 0 & -1 \\ -5 & -1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$

**Model-II:** The inverse of $B = \begin{bmatrix} 1 & 0 & 1 \\ 4 & 1 & 3 \\ 0 & 0 & 1 \end{bmatrix}$ is:

(a) $\begin{bmatrix} 1 & 0 & -1 \\ -4 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 & -1 \\ -4 & -1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 0 & 1 \\ -4 & 1 & -1 \\ 0 & 0 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 0 & 1 \\ -4 & 1 & 1 \\ 0 & 0 & -1 \end{bmatrix}$

**Model-III:** The inverse of $B = \begin{bmatrix} 1 & 0 & 1 \\ 3 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$ is:

(a) $\begin{bmatrix} 1 & 0 & -1 \\ -3 & -1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 & -1 \\ -3 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 0 & 1 \\ -3 & 1 & -1 \\ 0 & 0 & 1 \end{bmatrix}$ (d)

$\begin{bmatrix} 1 & 0 & 1 \\ -3 & 1 & 1 \\ 0 & 0 & -1 \end{bmatrix}$

**Model-IV:** The inverse of $B = \begin{bmatrix} 1 & 0 & 1 \\ 6 & 1 & 5 \\ 0 & 0 & 1 \end{bmatrix}$ is:

(a) $\begin{bmatrix} 1 & 0 & 1 \\ -6 & 1 & -1 \\ 0 & 0 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 & -1 \\ -6 & -1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 0 & 1 \\ -6 & 1 & 1 \\ 0 & 0 & -1 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 0 & -1 \\ -6 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$

**Model-V:** The inverse of $B = \begin{bmatrix} 1 & 0 & 1 \\ 7 & 1 & 6 \\ 0 & 0 & 1 \end{bmatrix}$ is:

(a) $\begin{bmatrix} 1 & 0 & 1 \\ -7 & 1 & -1 \\ 0 & 0 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 & -1 \\ -7 & -1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 0 & 1 \\ -7 & 1 & 1 \\ 0 & 0 & -1 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 0 & -1 \\ -7 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$

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## Question 3:

**Model-I:** Which of the following matrices is an elementary matrix?

(a) $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$ (d) $\begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$

**Model-II:** Which of the following matrices is an elementary matrix?

(a) $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 3 \\ 0 & 3 \end{bmatrix}$ (c) $\begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$ (d) $\begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$

**Model-III:** Which of the following matrices is an elementary matrix?

(a) $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 3 \\ 0 & 3 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$ (d) $\begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$

**Model-IV:** Which of the following matrices is an elementary matrix?

(a) $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 3 \\ 0 & 3 \end{bmatrix}$ (c) $\begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$ (d) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

**Model-V:** Which of the following matrices is an elementary matrix?

(a) $\begin{bmatrix} 0 & 1 \\ 1 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$ (d) $\begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$

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## Question 4:

**Model-I:** The matrix $\begin{pmatrix} 1 & 1 & 1 \\ 1 & m & 5 \\ 1 & 2 & m \end{pmatrix}$ is invertible if and only if:

(a) $m \in \{-1,1\}$ (b) $m \notin \{-1,3\}$ (c) $m \notin \{0,2\}$ (d) $m \in \{1,2\}$

**Model-II:** The matrix $\begin{pmatrix} 1 & 1 & 1 \\ 1 & m & 2 \\ 1 & 10 & m \end{pmatrix}$ is invertible if and only if:

(a) $m \in \{-2,4\}$ (b) $m \notin \{-2,2\}$ (c) $m \in \{-2,2\}$ (d) $m \notin \{-2,4\}$

**Model-III:** The matrix $\begin{pmatrix} 1 & 2 & 2 \\ 1 & m & 3 \\ 1 & 3 & m \end{pmatrix}$ is invertible if and only if:

(a) $m \in \{1,3\}$ (b) $m \notin \{1,3\}$ (c) $m \in \{-1,3\}$ (d) $m \notin \{-1,3\}$

**Model-IV:** The matrix $\begin{pmatrix} 1 & 2 & 2 \\ 1 & m & 4 \\ 1 & 4 & m \end{pmatrix}$ is invertible if and only if:

(a) $m \in \{0,2\}$ (b) $m \in \{0,-4\}$ (c) $m \notin \{0,4\}$ (d) $m \notin \{0,-4\}$

**Model-V:** The matrix $\begin{pmatrix} 1 & 2 & -1 \\ 1 & m & m^2 \\ 1 & 2 & m^3 \end{pmatrix}$ is invertible if and only if:

(a) $m \in \{-1,2\}$ (b) $m \notin \{-1,2\}$ (c) $m \in \{-1,1\}$ (d) $m \notin \{-1,1\}$

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## Question 5:

**Model-I:** The determinant of the matrix $\begin{pmatrix} a & a & b & 0 \\ a & a & 0 & b \\ d & 0 & a & a \\ 0 & d & a & a \end{pmatrix}$ is equal to:

(a) $bd(bd-4a^2)$ (b) $bd(bd-3a^2)$ (c) $bd(bd-2a^2)$ (d) $bd(bd-a^2)$

**Model-II:** The determinant of the following matrix is equal to:

$$\begin{pmatrix} b & b & a & 0 \\ b & b & 0 & a \\ d & 0 & b & b \\ 0 & d & b & b \end{pmatrix}$$

(a) $ad(ad-b^2)$ (b) $ad(ad-2b^2)$ (c) $ad(ad-3b^2)$ (d) $ad(ad-4b^2)$

**Model-III:** The determinant of the matrix $\begin{pmatrix} a & a & d & 0 \\ a & a & 0 & d \\ b & 0 & a & a \\ 0 & b & a & a \end{pmatrix}$ is equal to:

(a) $bd(bd-4a^2)$ (b) $bd(bd-a^2)$ (c) $bd(bd-3a^2)$ (d) $bd(bd-2a^2)$

**Model-IV:** The determinant of the matrix $\begin{pmatrix} d & d & b & 0 \\ d & d & 0 & b \\ a & 0 & d & d \\ 0 & a & d & d \end{pmatrix}$ is equal to:

(a) $ba(ba-4d^2)$ (b) $ba(ba-2d^2)$ (c) $ba(ba-3d^2)$ (d) $ba(ba-d^2)$

**Model-V:** The determinant of the matrix $\begin{pmatrix} a & a & b & 0 \\ a & a & 0 & b \\ 0 & d & a & a \\ d & 0 & a & a \end{pmatrix}$ is equal to:

(a) $bd(bd-a^2)$ (b) $bd(a^2-bd)$ (c) $bd(4a^2-bd)$ (d) $bd(bd-4a^2)$

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## Question 6:

**Model-I:** Let A and B be two matrices of order 3 such that $|A| = 2|B| = 4$. Then, $|2A^T B^3 adj(A^2)|$ is equal to:

(a) $4^8$ (b) $4^4$ (c) $4^6$ (d) $4^{10}$

**Model-II:** Let A and B be two matrices of order 3 such that $|A| = 3|B| = 6$. Then, $|3A^T B^3 adj(A^3)|$ is equal to:

(a) $6^4$ (b) $6^6$ (c) $6^8$ (d) $6^{10}$

**Model-III:** Let A and B be two matrices of order 3 such that $|A| = -3|B| = 3$. Then $|A^T B^3 adj(A^2) B^{-1}|$ is equal to:

(a) $3^3$ (b) $3^4$ (c) $3^5$ (d) $3^6$

**Model-IV:** Let A and B be two matrices of order 2 such that $|A| = 2|B| = 6$. Then, $|2A^{-1} B^2 adj(A^2) A^T|$ is equal to:

(a) $2^4$ (b) $3^4$ (c) $6^{-4}$ (d) $6^4$

**Model-V:** Let A and B be two matrices of order 4 such that $|B| = -2|A| = 1$. Then, $|2A^T B^3 adj(A^3) B^{-1}|$ is equal to:

(a) $2^{-2}$ (b) $2^{-4}$ (c) $2^{-6}$ (d) $2^{-8}$

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## Question 7:

**Model-I:** Let $\begin{bmatrix} 2 & 1 & 1 & -6\alpha \\ \alpha & 3 & 2 & 2\alpha \\ 2 & 1 & \alpha+1 & 4 \end{bmatrix}$ be the augmented matrix of a linear system. The set of values of $\alpha$ for which the system has a unique solution is:

(a) $\mathbb{R} - \{0,6\}$ (b) $\{0,6\}$ (c) $\{0,-1\}$ (d) $\mathbb{R} - \{0,-1\}$

**Model-II:** Let $\begin{bmatrix} 1 & 1 & -1 & 1 \\ 2 & 3 & \alpha & 3 \\ 1 & \alpha & 3 & 2 \end{bmatrix}$ be the augmented matrix of a linear system. The set of values of $\alpha$ for which the system has a unique solution is:

(a) $\{-3,2\}$ (b) $\mathbb{R} - \{-3,2\}$ (c) $\{3,-2\}$ (d) $\phi$

**Model-III:** Let $\begin{bmatrix} 1 & 2 & -3 & 4 \\ 3 & -1 & 5 & 2 \\ 4 & 1 & \alpha^2-14 & \alpha+2 \end{bmatrix}$ be the augmented matrix of a linear system. The set of values of $\alpha$ for which the system has a unique solution is:

(a) $\{-\sqrt{14}, \sqrt{14}, -2\}$ (b) $\{-4, 4\}$ (c) $\mathbb{R}-\{-4,4\}$ (d) $\phi$

**Model-IV:** Let $\begin{bmatrix} 1 & 1 & -1 & 3 \\ 1 & -1 & 3 & 4 \\ 1 & 1 & \alpha^2-10 & \alpha \end{bmatrix}$ be the augmented matrix of a linear system. The set of values of $\alpha$ for which the system has a unique solution is:

(a) $\phi$ (b) $\{-3, 3\}$ (c) $\{-\sqrt{10}, 0, \sqrt{10}\}$ (d) $\mathbb{R}-\{-3,3\}$

**Model-V:** Let $\begin{bmatrix} \alpha & 0 & \beta & 2 \\ \alpha & \alpha & 4 & 4 \\ 0 & \alpha & 2 & \beta \end{bmatrix}$ be the augmented matrix of a linear system. The values of $\alpha$ and $\beta$ for which the system has a unique solution is

(a) $\alpha \neq 0$ and $\beta \neq 2$ (b) $\alpha = 0$ and $\beta = 2$ (c) $\alpha \neq 0$ and $\beta = 2$ (d) $\alpha = 0$ and $\beta \neq 2$

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## Question 8:

**Model-I:** Let $\begin{bmatrix} a & 1 & 1 & 0 \\ 1 & 1 & -1 & 0 \\ 1 & 1 & a & 0 \end{bmatrix}$ be the augmented matrix of a linear system. The set of values of $a$ for which the system has nontrivial solutions is:

(a) $\{-1, 1\}$ (b) $\{-1, 0, 1\}$ (c) $\mathbb{R}-\{-1,0,1\}$ (d) $\mathbb{R}-\{-1,1\}$

**Model-II:** Let $\begin{bmatrix} a & -1 & 0 & 0 \\ -1 & a & -3 & 0 \\ 0 & -1 & a & 0 \end{bmatrix}$ be the augmented matrix of a linear system. The set of values of $a$ for which the system has nontrivial solutions is:

(a) $\{-1, 0, 1\}$ (b) $\{-2, 0, 2\}$ (c) $\mathbb{R}-\{-2,0,2\}$ (d) $\mathbb{R}-\{0\}$

**Model-III:** Let $\begin{bmatrix} 1 & 1 & -1 & 0 \\ 0 & a & -1 & 0 \\ 1 & 1 & a & 0 \end{bmatrix}$ be the augmented matrix of a linear system. The set of values of $a$ for which the system has nontrivial solutions is:

(a) $\mathbb{R}-\{-1,0,1\}$ (b) $\{-1,0,1\}$ (c) $\{-1,0\}$ (d) $\mathbb{R}-\{-1,0\}$

**Model-IV:** Let $\begin{bmatrix} 1 & 2 & 1 & 0 \\ 1 & 3 & 7 & 0 \\ 2 & 3 & a^2 & 0 \end{bmatrix}$ be the augmented matrix of a linear system. The set of values of $a$ for which the system has nontrivial solutions is:

(b) $\mathbb{R}-\{-2,2\}$ (b) $\{-2,2\}$ (c) $\mathbb{R}$ (d) $\phi$

**Model-V:** Let $\begin{bmatrix} 1 & 1 & a & 0 \\ 1 & 1 & b & 0 \\ a & b & 1 & 0 \end{bmatrix}$ be the augmented matrix of a linear system. The condition satisfied by $a$ and $b$ for which the system has nontrivial solutions is:

(a) $a=b$ (b) $a+b=0$ (c) $a \neq b$ (d) $ab=0$

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## Question 9:

**Model-I:** Let $\begin{bmatrix} 1 & 0 & 2 & a \\ 2 & 1 & 5 & b \\ 1 & -1 & 1 & c \end{bmatrix}$ be the augmented matrix of a linear system. The condition satisfied by $a$, $b$, and $c$ so that the system is consistent is:

(a) $b+c=3a$ (b) $a+b+c \neq 0$ (c) $a+b+c=0$ (d) $b+c-3a \neq 0$

**Model-II:** Let $\begin{bmatrix} 1 & 2 & -3 & a \\ 2 & 6 & -11 & b \\ 1 & -2 & 7 & c \end{bmatrix}$ be the augmented matrix of a linear system. The condition satisfied by $a$, $b$, and $c$ so that the system is consistent is:

(a) $b-2a=c$ (b) $5a=2b+c$ (c) $b-2a-c \neq 0$ (d) $2b+c-5a \neq 0$

**Model-III:** Let $\begin{bmatrix} 1 & 1 & -2 & a \\ 2 & -1 & -1 & b \\ 4 & 1 & -5 & c \end{bmatrix}$ be the augmented matrix of a linear system. The condition satisfied by $a$, $b$, and $c$ so that the system is consistent is:

(a) $2a+b-c\neq 0$ (b) $b-2a=c$ (c) $2a+b=c$ (d) $2a-b+c\neq 0$

**Model-IV:** Let $\begin{bmatrix} 1 & -2 & 5 & a \\ 4 & -5 & 8 & b \\ -3 & 3 & -3 & c \end{bmatrix}$ be the augmented matrix of a linear system. The condition satisfied by $a$, $b$, and $c$ so that the system is consistent is:

(a) $b+c-a\neq 0$ (b) $a+b-c\neq 0$ (c) $a+b-c=0$ (d) $b+c=a$

**Model-V:** Let $\begin{bmatrix} 1 & -1 & 3 & a \\ -2 & 1 & 5 & b \\ -3 & 2 & 2 & c \end{bmatrix}$ be the augmented matrix of a linear system. The condition satisfied by $a$, $b$, and $c$ so that the system is consistent is:

(a) $a-b+c=0$ (b) $a+b+c=0$ (c) $a+c\neq b$ (d) $a+b+c\neq 0$

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## Question 10:

**Model-I:** Let W = $\{(x,y,z,0,0)\,;x,y,z\in\mathbb{R}\,,2x-y=0\ and\ x+y-z=0\}$, then:

(a) { (1,2,3,0,0) } is a basis for W.

(b) { (1,-2,1,0,0) } is a basis for W.

(c ) { (1,0,1) , (1,2,0) } is a basis for W.

(d) { (1,0,1,0,0), (1,2,0,0,0) } is a basis for W .

**Model-II:** The set S = $\{2+3x\,,\ 1-x+x^2\,,\ 1+x+3x^2\}$ is a basis for $P_2$ (the space of polynomials of degree $\leq 2$).

If $p\in P_2$ with $[p]_S$ = (3,2,-2) , then:

(a) $p=6+5x-4x^2$ (b) $p=4-5x-4x^2$

(c) $p=3+2x-4x^2$ (d) $p=3+3x-4x^2$

**Model-III:** Let B = $\{v_1, v_2, v_3\}$ be a basis for a vector space V and C = $\{v_1 + 2v_2 - v_3, v_2 + v_3, v_2 - v_3\}$ is a subset of V. Then:

(a) C is a basis for V and $_BP_C = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 1 \\ -1 & 1 & -1 \end{bmatrix}$.

b) C is a basis for V and $_BP_C = \begin{bmatrix} 1 & 2 & -1 \\ 0 & 1 & 1 \\ 0 & 1 & 1 \end{bmatrix}$.

(c ) C is a basis for V and $_BP_C = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ -1 & 1 & -1 \end{bmatrix}$.

(d) C is not a basis for V.

**Model-IV:** If $A = \begin{bmatrix} 1 & -2 & 0 & 3 & -4 \\ -1 & 1 & 0 & -2 & 3 \end{bmatrix}$, then:

(a) the set {(2,-1,0,0,1) , (-1,1,0,1,0) , (0,0,1,0,0)} is a basis for *Null*(A).

(b) the set {(2,-1,0,0,1 ) , (-1,1,0,1,0) , (10,0,1,1)} is a basis for *Null*(A).

(c ) the set {(2,-1,0,1) , (-1,1,0,1) , (1,0,0,1)} is a basis for *Null*(A).

(d) Nullity (A) = 2.

**Model-V:** Let **V** be a vector space of dimension 7 and S a basis for V. If G= $\{v_1, v_2, v_3, v_4, v_5\}$ is linearly independent subset of V, where $v_4 \notin$ S, then:

(a) Any nonempty subset of S is linearly independent.

(b) The set S ∪ G is linearly independent.

(c) The set S ∩ G generates V.

(d) the set G is a basis for V.

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## Question 11:

**Model-I:** Let B = { $v_1, v_2, v_3$ } is a basis for a subspace W of $\mathbb{R}^4$ and C = {(1,0,0,1), (-1,1,0,1), (0,0,1,1)} is another basis for W. If ${}_C P_B = \begin{bmatrix} 1 & 2 & 1 \\ -1 & 1 & 1 \\ 2 & 1 & 1 \end{bmatrix}$ (the transition matrix from B to C), then:

(a) $v_3 = (0,1,1,3)$ (b) (-1,1,1,2) $\notin$ W

(c) (1,1,0,2) $\in$ W (d) the set C is not linearly independent.

**Model-II:** If G = {(a, b, 2a+b, 2b, a, 0): a and b are real numbers} is a subspace of $\mathbb{R}^6$, then:

(a) the set {(1,0,2,0,1,0), (0,1,1,2,0,0)} is a basis for G.

(b) the set {(1,0,2,0,1,0), (1, 0, 0 ,0,-1 ,1)} spans G.

(c) (1,-1,1,-2,1,0) $\notin$ G.

(d) G is not a linear subspace of $\mathbb{R}^6$.

**Model-III:** Let $A = [v_1 \quad v_2 \quad v_3 \quad v_4 \quad v_5 \quad v_6] = \begin{bmatrix} 1 & 2 & 1 & 2 & 0 & 1 \\ -1 & -2 & 0 & -1 & 1 & 1 \\ 3 & 6 & 1 & 4 & -2 & 0 \end{bmatrix}$. Then:

(a) The set $\{v_1, v_3, v_6\}$ spans $\mathbb{R}^3$.

(b) The set $\{v_1, v_3, v_4\}$ spans $\mathbb{R}^3$.

(c) Rank $(A) = 4$.

(d) Nullity $(A) = 2$.

**Model-IV:** If A = $\begin{bmatrix} 1 & -2 & 0 & 3 & -4 \\ -1 & 1 & 0 & -2 & 3 \end{bmatrix}$, then:

(a) the set {(2,-1,0,0,1) , (-1,1,0,1,0) , (0,0,1,0,0)} is a basis for *Null* (A).

(b) the set {(2,-1,0,0,1) , (-1,1,0,1,0) , (10,0,1,1)} is a basis for *Null* (A).

(c) the set {(2,-1,0,1) , (-1,1,0,1) , (1,0,0,1)} is a basis for *Null* (A).

(d) Nullity (A) = 2.

**Model-V:** Let W be a subspace of $\mathbb{R}^3$spanned by the set B ={(3,-2,1), (2,-3,-1)}. If C = {(1,-1,0), (1, 0, 1)} is a basis for W, then:

(a) $_{C}P_{B} = \begin{bmatrix} 2 & 3 \\ 1 & -1 \end{bmatrix}$ (b) $_{C}P_{B} = \begin{bmatrix} 2 & 2 \\ 3 & 1 \end{bmatrix}$

(c) $_{B}P_{C} = \begin{bmatrix} 1 & 1 \\ 1 & 2 \end{bmatrix}$ (d) B is not a linearly independent set.

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## Question 12:

**Model-I:** Let $V$ be a vector space of dimension 4 and $u, w \in V$. If $S = \{u, w, u - w, 2u + 3w\}$, then:

(a) $S$ is a linearly dependent set.

(b) $S$ is a linearly independent set.

(c) $S$ spans $V$.

(d) $S$ contains a basis for $V$.

**Model-II:** Let $A$ be a $5 \times 8$ matrix. If *rank* ($A$) = 3, then:

(a) Nullity $(A^T) = 2$.

(b) Nullity $(A) = 2$.

(c) rank $(A^T) = 5$.

(d) dim (***row*** $(A)) = 5$.

**Model-III:** Determine which of the following statements is true:

(a) W = $\{(x - y , 2z , 0) : x, y , z \in \mathbb{R}\}$ is a subspace of $\mathbb{R}^3$ and (1,1,0) ∈ W.

(b) G = $\{(x, 2x + y , x) : x, y \in \mathbb{R} \}$ is a subspace of $\mathbb{R}^3$ and (1,0,2) ∈ G.

(c) the set $\{(x , y, y + 2) : x, y \in \mathbb{R}\}$ is a subspace of $\mathbb{R}^3$.

(d) the set $\{(x, y, x + y , xy) : x, y \in \mathbb{R}\}$ is a subspace of $\mathbb{R}^3$.

**Model-IV:** If W is the subspace of $\mathbb{R}^4$ spanned by the set S = {(1,1,01), ( -1,0,0,1), (0,0,1,1)}, then:

(a) (0,1,0,2) ∈ W.

(b) (1,1,1,1) ∈ W.

(c) (0,1,0,2) ∉ W.

(d) S is linearly dependent set.

**Model-V:** If $A = \begin{bmatrix} R_1 \\ R_2 \\ R_3 \\ R_4 \\ R_5 \\ R_6 \end{bmatrix} = \begin{bmatrix} 1 & -1 & 1 \\ -2 & 2 & -2 \\ 3 & 0 & 1 \\ 1 & 2 & -1 \\ 2 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$, then:

(a) The set $\{R_1, R_3, R_6\}$ is linearly independent.

(b) The set $\{R_1, R_2, R_6\}$ is linearly independent.

(c) The set $\{R_1, R_2, R_3\}$ is linearly independent.

(d) Nullity (A) = 4.

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## Question 13:

**Model-I:** If $\boldsymbol{u}$ and $\boldsymbol{v}$ are vectors in a real inner product space (**V** , < **,** >) with $\|\boldsymbol{u}\| = 2$ and $\|\boldsymbol{v}\| = 3$, which of the following statements is correct?

(a). The number $< \boldsymbol{u} , \boldsymbol{v} >$ is less than 5.

(b). The number $| < \boldsymbol{u} , \boldsymbol{v} > |$ is equal to 6.

(c). The number $< \boldsymbol{u}, \boldsymbol{v} >$ is greater than or equal to 5.

(d). The number $< \boldsymbol{u}, \boldsymbol{v} >$ is less than or equal to 6.

**Model-II:** If $\boldsymbol{u}$ and $\boldsymbol{v}$ are vectors in a real inner product space (**V** , < **,** >) with $\|\boldsymbol{u}\| = 1$ and $\|\boldsymbol{v}\| = 2,$ which of the following statements is correct?

(a). The number $< \boldsymbol{u}, \boldsymbol{v} >$ lies between 1 and 2

(b). The number $| < \boldsymbol{u}, \boldsymbol{v} > |$ is less than or equal to 2.

(c). The number $< \boldsymbol{u}, \boldsymbol{v} >$ is less than 1.

(d). The number $| < \boldsymbol{u}, \boldsymbol{v} > |$ is greater than or equal to $\frac{1}{2}$.

**Model-III:** If $\boldsymbol{u}$ and $\boldsymbol{v}$ are linearly dependent vectors in a real inner product space (**V** , < **,** >) with $\|\boldsymbol{u}\| = 3$ and $\|\boldsymbol{v}\| = 2,$ which of the following statements is correct?

(a). The number $| < \boldsymbol{u}, \boldsymbol{v} > |$ is equal to 6.

(b). The number $2 < \boldsymbol{u}, \boldsymbol{v} >$ is greater than 6.

(c). The number $< \boldsymbol{u}, \boldsymbol{v} >$ always lie between 0 and 6.

(d). The number $| < \boldsymbol{u}, \boldsymbol{v} > |$ strictly less than 6.

**Model-IV):** If $\boldsymbol{u}$ and $\boldsymbol{v}$ are linearly independent vectors in a real inner product space (**V** , < **,** >) with $\|\boldsymbol{u}\| = 3$ and $\|\boldsymbol{v}\| = \frac{1}{3}$, which of the following statements is correct?

(a). The number $| < \boldsymbol{u}, \boldsymbol{v} > |$ is strictly less than 1.

(b). The number $| < \boldsymbol{u}, \boldsymbol{v} > |$ is equal to $\frac{\mathbf{1}}{\mathbf{3}}$.

(c). The number $< \boldsymbol{u}, \boldsymbol{v} >$ is greater than or equal to $\frac{\mathbf{1}}{\mathbf{3}}$.

(d). The number $< \boldsymbol{u}, \boldsymbol{v} >$ is equal to 1.

**Model-V:** If $\boldsymbol{u}$ and $\boldsymbol{v}$ are vectors in a real inner product space (**V**, < **,** >) with $\|\boldsymbol{u}\| = 4$ and $\|\boldsymbol{v}\| = 3,$ which of the following statements is correct?

(a). The number $< \boldsymbol{u}, \boldsymbol{v} >$ is always less than 7.

(b). The number $| < \boldsymbol{u}, \boldsymbol{v} > |$ is equal to 12.

(c). The number $< \boldsymbol{u}, \boldsymbol{v} >$ is cannot be 12.

(d). The number $| < \boldsymbol{u}, \boldsymbol{v} > |$ is less than or equal to 12.

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**Question 14:**

**Model-I:** Let $\boldsymbol{B} = \{v_1, v_2, v_3\}$ be an orthogonal set of non-zero vectors in the Euclidean inner product space $\mathbb{R}^3$. Which of the following statements is correct?

(a). $\boldsymbol{B}$ is linearly dependent.

(b). $\boldsymbol{span}\ (\boldsymbol{B}) = \mathbb{R}^3$.

(c). $\boldsymbol{B}$ is orthonormal.

(d). $\boldsymbol{B}$ is not a basis for $\mathbb{R}^3$.

**Model-II:** Let $\boldsymbol{B} = \{v_1, v_2, v_3\}$ be an orthogonal set of non-zero vectors in the Euclidean inner product space $\mathbb{R}^3$. Which of the following statements is correct?

(a). $\boldsymbol{B}$ is linearly independent.

(b). $\boldsymbol{span}(\boldsymbol{B})$ is a proper subspace of $\mathbb{R}^3$.

(c). $\boldsymbol{B}$ is an orthonormal basis for $\boldsymbol{span}(\boldsymbol{B})$.

(d). $\boldsymbol{B}$ is linearly dependent.

**Model-III:** Let $\boldsymbol{B} = \{v_1, v_2, v_3\}$ be an orthogonal set of non-zero vectors in the Euclidean inner product space $\mathbb{R}^3$. Which of the following statements is correct?

(a). $\boldsymbol{B}$ is a basis for $\mathbb{R}^3$.

(b). $\boldsymbol{span}\ (\boldsymbol{B})$ is a proper subspace of $\mathbb{R}^3$.

(c). $\boldsymbol{B}$ is normal.

(d). $\boldsymbol{B}$ is linearly dependent.

**Model-IV:** Let $\boldsymbol{B} = \{v_1, v_2, v_3\}$ be an orthogonal set of non-zero vectors in the Euclidean inner product space $\mathbb{R}^3$. Which of the following statements is correct?

(a). $\boldsymbol{B}$ is an orthonormal basis for $\mathbb{R}^3$.

(b). $\boldsymbol{span}(\boldsymbol{B})$ is a proper subspace of $\mathbb{R}^3$.

(c). $\boldsymbol{B}$ is an orthonormal basis for $\boldsymbol{span}(\boldsymbol{B})$.

(d). dim($\boldsymbol{span}(\boldsymbol{B})$) = 3.

**Model-V:** Let $\boldsymbol{B} = \{v_1, v_2, v_3\}$ be an orthogonal set of non-zero vectors in the Euclidean inner product space $\mathbb{R}^{\mathbf{3}}$. Which of the following statements is correct?

(a). $\boldsymbol{B}$ is not an orthonormal basis for $\mathbb{R}^{\mathbf{3}}$.

(b). $\boldsymbol{span}(\boldsymbol{B})$ is a proper subspace of $\mathbb{R}^{\mathbf{3}}$.

(c). dim($\boldsymbol{span}(\boldsymbol{B})$) ≥ 3.

(d). dim($\boldsymbol{span}(\boldsymbol{B})$) ≠ 3.

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## Question 15:

**Model-I:** If the Gram-Schmidt orthogonalization algorithm is applied on the set $\{v_1 \coloneqq (1,1,1,0), v_2 \coloneqq (0,1,0,1)\}$ of vectors in the Euclidean inner product space $\mathbb{R}^{\mathbf{4}}$, which of the following sets is obtained?

(a). $\left\{(-1,1,1,0), (\frac{1}{3}, 0, \frac{1}{3}, 1)\right\}$.

(b). $\left\{(1,1,1,0), (-\frac{1}{3}, \frac{2}{3}, -\frac{1}{3}, 1)\right\}$.

(c). $\{(0,1,1,0), (-1,0,0,1)\}$.

(d). $\{(0,1,0,1), (-1,1,-1,0)\}$.

**Model-II:** If the Gram-Schmidt orthogonalization algorithm is applied on the set $\{\mathrm{v}_1 \coloneqq (0,1,0,1), \mathrm{v}_2 \coloneqq (1,1,1,0)\}$ of vectors in the Euclidean inner product space $\mathbb{R}^{\mathbf{4}}$, which of the following sets is obtained?

(a). $\left\{(1, \frac{1}{2}, 1, -\frac{1}{2}), (0,1,0,1)\right\}$.

(b). $\left\{(1,1,1,0), (1, \frac{1}{2}, 1, -\frac{1}{2})\right\}$.

(c). $\left\{(1,1,1,0), (1, \frac{1}{2}, -\frac{1}{2}, 1)\right\}$.

(d). $\left\{\left(-\frac{1}{3},\frac{2}{3},-\frac{1}{3},1\right),(1,\frac{1}{2},1,-\frac{1}{2})\right\}$.

**Model-III:** If the Gram-Schmidt orthogonalization algorithm is applied on the set $\{v_1 \coloneqq (1,0,-1,1), v_2 \coloneqq (0,-1,1,0)\}$ of vectors in the Euclidean inner product space $\mathbb{R}^4$, which of the following sets is obtained?

(a). $\left\{(1,0,-1,1),(1,-\frac{1}{2},-\frac{1}{2},1)\right\}$.

(b). $\left\{(0,\frac{2}{3},-\frac{1}{3},\frac{1}{3}),(1,0,-1,1)\right\}$.

(c). $\left\{(1,0,-1,1),(\frac{1}{3},-1,\frac{2}{3},\frac{1}{3})\right\}$.

(d). $\left\{(1,0,-1,1),(-1,\frac{1}{2},\frac{1}{2},-1)\right\}$

**Model-IV:** If the Gram-Schmidt orthogonalization algorithm is applied on the set $\{v_1 \coloneqq (0,-1,1,0), v_2 \coloneqq (1,0,-1,1)\}$ of vectors in the Euclidean inner product space $\mathbb{R}^4$, which of the following sets is obtained?

(a). $\left\{(0,1,-1,0),(-1,-\frac{1}{2},-\frac{1}{2},\frac{3}{2})\right\}$.

(b). $\left\{(1,-1,0,0),(0,0,\frac{1}{2},-\frac{1}{2})\right\}$.

(c). $\left\{\left(1,1,\frac{2}{3},0\right),(1,-1,0,0)\right\}$.

(d). $\left\{(0,-1,1,0),(1,-\frac{1}{2},-\frac{1}{2},1)\right\}$.

**Model-V:** If the Gram-Schmidt orthogonalization algorithm is applied on the set $\{v_1 \coloneqq (1,0,0,1), v_2 \coloneqq (0,1,1,1)\}$ of vectors in the Euclidean inner product space $\mathbb{R}^4$, which of the following sets is obtained?

(a). $\left\{(1,0,0,1),(-\frac{1}{2},-1,-1,\frac{1}{2})\right\}$.

(b). $\left\{(-\frac{1}{2},1,1,\frac{1}{2}),(1,0,0,1)\right\}$.

(c). $\left\{(1,1,1,0),(-\frac{1}{2},-1,1,\frac{1}{2})\right\}$.

(d). $\left\{(\frac{1}{3},1,\frac{2}{3},-\frac{1}{3}),(0,1,1,1)\right\}$.

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## Question 16:

**Model-I:** Let $\alpha \in R$ $and$ $T: R^3 \to R^2$ ; $T(x,y,z) = (x + y - 3z\,,\ z + y + \propto^2 - 3 \propto +2)$ be a function. Then the value(s) of $\propto$ such that $T$ is **not** a linear transformation is (are):

$a)\ \propto = 1$ $b)\ \propto = 2$ $c)\ \propto \in \{1,2\}$ $d)\ \propto \in R - \{1,2\}$

**Model-II:** Let $\alpha \in R$ $and$ $T: R^3 \to R^2$ ; $T(x,y,z) = (x + y - 3z\,,\ z + y + \propto^2 + 3 \propto +2)$ be a function, Then the value (s) of $\propto$ such that $T$ is **not** a linear transformation is (are):

$a)\ \propto = -1$ $b)\ \propto = -2$ $c)\ \propto \in \{-1,-2\}$ $d)\ \propto \in R - \{-1,-2\}$

**Model-III:** Let $\alpha \in R$ $and$ $T: R^3 \to R^2$ ; $T(x,y,z) = (x + y - 3z\,,\ z + y + \propto^2 - 1)$ be a function. Then the value (s) of $\propto$ such that $T$ is **not** a linear transformation is (are):

$a)\ \propto = -1$ $b)\ \propto = 1$ $c)\ \propto \in \{-1,1\}$ $d)\ \propto \in R - \{-1,+1\}$

**Model-IV:** Let $\alpha \in R$ $and$ $T: R^3 \to R^2$ ; $T(x,y,z) = (x + y - 3z\,,\ z + y + \propto^2 + 5 \propto +6)$ be a function. Then the value (s) of $\propto$ such that $T$ is **not** a linear transformation is (are):

$a)\ \propto = -2$ $b)\ \propto = -3$ $c)\ \propto \in \{-2,-3\}$ $d)\ \propto \in R - \{-2,-3\}$

**Model-V:** Let $\alpha \in R$ $and$ $T: R^3 \to R^2$ ; $T(x,y,z) = (x + y - 3z\,,\ z + y + \propto^2 + 5 \propto +4)$ be a function. Then the value (s) of $\propto$ such that $T$ is **not** a linear transformation is (are):

$a)\ \propto = -1$ $b)\ \propto = -4$ $c)\ \propto \in \{-1,-4\}$ $d)\ \propto \in R - \{-1,-4\}$

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## Question 17:

**Model-I:** Let $T: R^3 \to R^2$ ; $T(x,y,z) = (x + y\,, y - z)$ be a linear transformation. Then the standard matrix of $T$ with respect to the natural bases is:

$a)\begin{pmatrix} -1 & -1 & 0 \\ 0 & 1 & -1 \end{pmatrix}$ $b)\begin{pmatrix} 1 & 1 & 0 \\ 0 & 1 & -1 \end{pmatrix}$ $c)\begin{pmatrix} 1 & -1 & 0 \\ 0 & -1 & 1 \end{pmatrix}$ $d)\begin{pmatrix} -1 & 1 & 0 \\ 0 & -1 & -1 \end{pmatrix}$

**Model=II:** Let $T: R^3 \to R^2$ ; $T(x,y,z) = (x-y\,, y+z)$ be a linear transformation. Then the standard matrix of $T$ with respect to the natural bases is:

$a)\begin{pmatrix} -1 & -1 & 0 \\ 0 & -1 & -1 \end{pmatrix}$ $b)\begin{pmatrix} 1 & -1 & 0 \\ 0 & 1 & 1 \end{pmatrix}$ $c)\begin{pmatrix} 1 & 1 & 0 \\ 0 & -1 & -1 \end{pmatrix}$ $d)\begin{pmatrix} -1 & 1 & 0 \\ 0 & -1 & -1 \end{pmatrix}$

**Model-III:** Let $T: R^3 \to R^2$ ; $T(x,y,z) = (-x+y\,, y-z)$ be a linear transformation. Then the standard matrix of $T$ with respect to the natural bases is:

$a)\begin{pmatrix} -1 & -1 & 0 \\ 0 & -1 & -1 \end{pmatrix}$ $b)\begin{pmatrix} -1 & 1 & 0 \\ 0 & 1 & -1 \end{pmatrix}$ $c)\begin{pmatrix} 1 & 1 & 0 \\ 0 & -1 & -1 \end{pmatrix}$ $d)\begin{pmatrix} -1 & 1 & 0 \\ 0 & -1 & -1 \end{pmatrix}$

**Model-IV:** Let $T: R^3 \to R^2$ ; $T(x,y,z) = (x-y\,, y-z)$ be a linear transformation, then the standard matrix of $T$ with respect to the natural bases is:

$a)\begin{pmatrix} -1 & 1 & 0 \\ 0 & -1 & -1 \end{pmatrix}$ $b)\begin{pmatrix} 1 & -1 & 0 \\ 0 & 1 & -1 \end{pmatrix}$ $c)\begin{pmatrix} 1 & -1 & 0 \\ 0 & -1 & 1 \end{pmatrix}$ $d)\begin{pmatrix} 1 & 1 & 0 \\ 0 & -1 & 1 \end{pmatrix}$

**Model-V:** Let $T: R^3 \to R^2$ ; $T(x,y,z) = (x-y\,, -y+z)$ be a linear transformation. Then the standard matrix of $T$ with respect to the natural bases is:

$a)\begin{pmatrix} -1 & -1 & 0 \\ 0 & -1 & -1 \end{pmatrix}$ $b)\begin{pmatrix} 1 & -1 & 0 \\ 0 & -1 & 1 \end{pmatrix}$ $c)\begin{pmatrix} 1 & 1 & 0 \\ 0 & -1 & -1 \end{pmatrix}$ $d)\begin{pmatrix} -1 & 1 & 0 \\ 0 & -1 & -1 \end{pmatrix}$

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## Question 18:

**Model-I:** If A = $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 0 & 2 \\ 1 & x & 0 \end{bmatrix}$, then the value of $x$ which makes the vector $\begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$ an eigenvector of A is:

a) $x = 0$ b) $x = 1$ c) $x = 2$ d) $x = -1$

**Model-II:** If B = $\begin{bmatrix} x & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$, then the value of $x$ which makes the vector $\begin{pmatrix} 1 \\ -1 \\ 0 \end{pmatrix}$ an eigenvector of B is:

a) $x = -1$ b) $x = 0$ c) $x = 1$ d) $x = 2$

**Model-III:** If A = $\begin{bmatrix} x & 1 & 1 \\ 1 & 1 & -1 \\ -2 & 1 & 2 \end{bmatrix}$, then the value of $x$ which makes the vector $\begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix}$ an eigenvector of A is:

a) $x = 1$ b) $x = 0$ c) $x = -1$ d) $x = 2$

**Model-IV:** If B = $\begin{bmatrix} x & 0 & 1 \\ 1 & 1 & 1 \\ 1 & -1 & -3 \end{bmatrix}$, then the value of $x$ which makes the vector $\begin{pmatrix} 1 \\ -1 \\ 1 \end{pmatrix}$ an eigenvector of B is:

a) $x = 1$ b) $x = 0$ c) $x = -2$ d) $x = -1$

**Model-V:** If A = $\begin{bmatrix} x & -2 & 1 \\ 1 & -1 & 2 \\ 1 & -1 & -2 \end{bmatrix}$, then the value of $x$ which makes the vector $\begin{pmatrix} 1 \\ 1 \\ -1 \end{pmatrix}$ an eigenvector of A is:

a) $x = 0$ b) $x = 2$ c) $x = -1$ d) $x = 1$

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## Question 19:

**Model-I:** If B = $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 1 & 1 \end{bmatrix}$, then the eigenvalues of B are:

a) 1, 2, 3 b) 1, 2 c) 0, 1, 2 d) 2, 3

**Model-II:** If A = $\begin{bmatrix} 3 & 0 & -1 \\ 2 & 4 & 2 \\ -1 & 0 & 3 \end{bmatrix}$, then the eigenvalues of A are:

a) 2, 3 b) 2, -1 c) 2, 4 d) 3, 4

**Model-III:** If B = $\begin{bmatrix} 1 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 1 \end{bmatrix}$, then the eigenvalues of B are:

a) -1, 1, 2 b) 1, 2 c) -1, 2 d) -1, 1, -2

**Model-IV:** If A = $\begin{bmatrix} 1 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 1 \end{bmatrix}$, then the eigenvalues of A are:

a) 0, 1, 2 b) 0, 1, 3 c) 1, 2 d) 0, 3

**Model-V:** If B = $\begin{bmatrix} 1 & 0 & 0 \\ 1 & -2 & 0 \\ 1 & 1 & 3 \end{bmatrix}$, then the eigenvalues of B are:

a) 0, 1, 2 b) 0,2 c) 1,2 d) -2,1,3

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## Question 20:

**Model-I:** If A is an *n*x*n* matrix such that $A^2$ = A. Then, the eigenvalues of A are:

a) 0, -1 b) 1, *n* c) 0, 1 d) -1, 1

**Model-II:** If *v* = $\begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix}$ is an eigenvector of the matrix B with respect to the eigenvalue -1, then $B^3v$ is equal to:

$a)$ $\begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix}$ b) $\begin{bmatrix} 0 \\ -1 \\ 1 \end{bmatrix}$ c) $\begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$ d) $\begin{bmatrix} -1 \\ 1 \\ 0 \end{bmatrix}$

**Model-III:** If A = $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ and $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$ is an eigenvector of A with respect to the eigenvalue 1 and $\begin{bmatrix} 0 \\ 1 \end{bmatrix}$ is an eigenvector of A with respect to the eigenvalue -1, then A is equal to:

$a)$ $\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$ b) $\begin{bmatrix} 1 & 1 \\ 2 & 1 \end{bmatrix}$ c) $\begin{bmatrix} 2 & -1 \\ 1 & 0 \end{bmatrix}$ d) $\begin{bmatrix} 1 & 0 \\ 2 & -1 \end{bmatrix}$

**Model-IV:** If v = $\begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}$ is an eigenvector of the matrix B with respect to the eigenvalue -2, then $B^2$v is equal to:

$a)$ $\begin{bmatrix} -1 \\ 1 \\ -1 \end{bmatrix}$ b) $\begin{bmatrix} -2 \\ 2 \\ -2 \end{bmatrix}$ c) $\begin{bmatrix} 2 \\ -2 \\ 2 \end{bmatrix}$ d) $\begin{bmatrix} 4 \\ -4 \\ 4 \end{bmatrix}$

**Model-V:** If A = $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ and $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$ is an eigenvector of A with respect to the eigenvalue -1 and $\begin{bmatrix} 0 \\ 1 \end{bmatrix}$ is an eigenvector of A with respect to the eigenvalue 1, then A is equal to:

$a)$ $\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$ b) $\begin{bmatrix} -1 & 0 \\ -2 & 1 \end{bmatrix}$ c) $\begin{bmatrix} 2 & -1 \\ 1 & 0 \end{bmatrix}$ d) $\begin{bmatrix} 1 & 0 \\ 2 & -1 \end{bmatrix}$

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