IIT/EKLAVYA BATCH
THE GURUKUL INSTITUTE

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GURUKUL QUIZ ON MATRICES AND DETERMINANTS

A. Q1 to Q30 are multiple choice questions.
B. Q31 to Q36 are subjective problems.
C. Q1 to Q10 carry each of 4 marks. 0 marks will be deducted for wrong answer.
D. Q11 to Q30 carry each of 3 marks. 1mark will be deducted for each wrong answer.
E. Q31 to Q36 carry each of 9 marks

M.C.Q's(More than one may be correct option)

1. A square matrix A is invertible iff detA may be
   a) 0 b) 1 c)non zero d) -1
2. A square matrix A = $[a_{ij}]_{nxn}$ is called a triangular matrix iff $a_{ij} = 0$ for
   a) i = j b) i<j c) i>j d) none of these
3. If the determinant $\begin{vmatrix} a & b & a\alpha+b \\ b & c & b\alpha+c \\ a+b & b\alpha+c & 0 \end{vmatrix}$ = 0 then
   a) A, b, c are in A.P. c) either a, b, c are in G.P.
   b) A, b, c are in H.P d) α is the root of the equation $ax^2 + 2bx + c = 0$
4. The system of equations x + 2y + 3z = 4; 2x + 3y + 4z = 5; 3x + 4y + 5z = 6 has
   a) Many solutions c)no solution
   b) Unique solution d) infinite solutions
5. Which of the following
   i. Adjoint of a symmetric matrix is symmetric.
   ii. Adjoint of a unit matrix is a unit matrix.
   iii. A(adj A) = (adj A)A = $|A|I$ and
   iv. Adjoint of a diagonal matrix is a diagonal matrix
   Is /are correct
   a) i. b) ii. c) iii. And iv. D) i. and ii.
6. If A and B are two matrices such that A+ B and AB both defined then
   a) A and B are two matrices necessarily of same order
   b) A and B are square matrices of same order
   c) Number of columns of A = number of rows of B
   d) None of these
7. If A is a square matrix and $A + A^T$ is symmetric matrix, then $A - A^T$ =
   a) Unit matrix c) Skew- Symmetric matrix
   b) Symmetric matrix d) Zero Matrix
8. If $\begin{vmatrix} x+\alpha & \beta & \gamma \\ \alpha & x+\beta & \gamma \\ \alpha & \beta & x+\gamma \end{vmatrix}$ = 0 then
   a) 0 b) $-(\alpha+\beta+\gamma)$ c) 1 d) $\alpha^2+\beta^2+\gamma^2$
9. If in the determinant $\Delta = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$ and A_1, B_1, C_1 etc. be the co – factors of a_1, b_1, c_1 etc. then which of the following relations are correct
   a) $a_1A_1 + b_1B_1 + c_1C_1 = \Delta$ c) $a_3A_3 + b_3B_3 + c_3C_3 = \Delta$
   b) $b_1B_1 + b_2B_2 + c_2C_2 = \Delta$ d) $a_1A_2 + b_1B_2 + c_1C_2 = \Delta$

10. The equation $\begin{vmatrix} 2x & 0 & 0 \\ x+2 & x+1 & 0 \\ x+3 & x+4 & x^2+1 \end{vmatrix} = 0$ has the solution

a) $x = -1$ b) $x = 0$ c) $x = -3$ d) $x = -4$

M.C.Q's (Only one correct option)

11. Multiplicative inverse of matrix $\begin{bmatrix} 2 & 1 \\ 7 & 4 \end{bmatrix}$ is

a) $\begin{bmatrix} 4 & -1 \\ -7 & -2 \end{bmatrix}$ c) $\begin{bmatrix} -4 & -1 \\ 7 & -2 \end{bmatrix}$

b) $\begin{bmatrix} 4 & -1 \\ 7 & 2 \end{bmatrix}$ d) $\begin{bmatrix} 4 & -1 \\ -7 & 2 \end{bmatrix}$

12. If $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 3 & 4 \end{bmatrix}$, then adj (adj A) =

a) A b) – A c) A^2 d) none of these

13. If A and B are arbitrary square matrices of the same order then

a) (AB)' = A'B' c) (A+ B)' = A' – B'

b) (A')' (B')' = B'A' d) (AB)' = B'A'

14. If a matrix A is symmetric as well as skew symmetric then A is a

a) Diagonal matrix c) unit matrix

b) Null matrix d) none of these

15. If for a matrix A, $A^2 + I = 0$ where I is the identity matrix, then A equals

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

b) $\begin{bmatrix} i & 0 \\ 0 & -i \end{bmatrix}$ d) none of these

16. If $A = \begin{bmatrix} ab & b^2 \\ -a^2 & -ab \end{bmatrix}$, then A is

a) Indempotent b) involuntary c) nilpotent d) scalar

17. The adjoint of the matrix $A = \begin{bmatrix} 1 & 2 \\ 3 & -5 \end{bmatrix}$ is

a) $\begin{bmatrix} -5 & -2 \\ -3 & 1 \end{bmatrix}$ c) $\begin{bmatrix} 1 & -2 \\ 3 & 5 \end{bmatrix}$

b) $\begin{bmatrix} -5 & -3 \\ -2 & 1 \end{bmatrix}$ d) none of these

18. For what values of 'a' exactly one root of the equation $2^a x^2 - 4^a x + 2^a - 1 = 0$ lies between 1 and 2.

19. Find the values of 'a' for which inequality $\tan^2 x + (a+1)\tan x - (a-3) < 0$ is true for at least one $x \in \left(0, \frac{\pi}{2}\right)$.

20. Solve the equation- $(x)^2 = [x]^2 + 2x$ where (x) and [x] are the integer just less than or equal to x and just greater than or equal to x respectively.

21. If the equation $ax^2 + 2bx + c = 0$ has real roots a, b, c being real numbers and if m and n are real number such that $m^2 > n > 0$ then prove that the equation $ax^2 + 2mbx + nc = 0$ has real roots.

22. Obtain a quadratic expression in x and solve for it if

$$x = 1 + \cfrac{1}{3 + \cfrac{1}{2 + \cfrac{1}{3 + \cfrac{1}{2 + ---- \text{to } \infty}}}}$$

23. Solve for x: If $(x - 1)^3 + (x - 2)^3 + (x - 3)^3 + (x - 4)^3 + (x - 5)^3 = 0$