Assignment-2
CHAPETR-15
Matrices and Determinants

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1 Section-B

1) Let $\mathbf{A} = \begin{pmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{pmatrix}$. The only correct statement about the matrix A is [2004]
   a) $A^2 = I$
   b) $A = (-1) I$,where I is a unit matrix
   c) A^{-1} does not exist
   d) A is a zero matrix
2) Let $\mathbf{A} = \begin{pmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{pmatrix}$, and $10\mathbf{B} = \begin{pmatrix} 4 & 2 & 2 \\ -5 & 0 & \alpha \\ 1 & -2 & 3 \end{pmatrix}$. If B is the inversion of matrix A, then α is [2004]
   a) 5
   b) -1
   c) 2
   d) -2
3) If $a_1, a_2, a_3, \ldots, a_n, \ldots$ are in G.P, then the value of the determinant [2004]
   $\begin{vmatrix} \log a_n & \log a_{n+1} & \log a_{n+2} \\ \log a_{n+3} & \log a_{n+4} & \log a_{n+5} \\ \log a_{n+6} & \log a_{n+7} & \log a_{n+8} \end{vmatrix}$, is
   a) -2
   b) 1
   c) 2
   d) 0
4) If $A^2 - A + I = 0$, then the inverse of A is [2005]
   a) A+I
   b) A
   c) A-I
   d) I-A
5) The system of equations
   $\alpha x + y + z = \alpha - 1$
   $x + \alpha y + z = \alpha - 1$

$x + y + \alpha z = \alpha - 1$
has infinite solutions, if α is [2005]

a) -2
b) either -2 or 1
c) not -2
d) 1

6) If $a^2 + b^2 + c^2 = -2$ and
f(x)= $\begin{vmatrix} 1+a^2x & \left(1+b^2\right)x & \left(1+c^2\right)x \\ \left(1+a^2\right)x & 1+b^2x & \left(1+c^2\right)x \\ \left(1+a^2\right)x & \left(1+b^2\right)x & 1+c^2x \end{vmatrix}$ then $f(x)$ is a polynomial of degree [2005]

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

7) If $a_1, a_2, a_3, \ldots, a_n, \ldots$ are in G.P,then the determinant [2005]
Δ= $\begin{vmatrix} \log a_n & \log a_{n+1} & \log a_{n+2} \\ \log a_{n+3} & \log a_{n+4} & \log a_{n+5} \\ \log a_{n+6} & \log a_{n+7} & \log a_{n+8} \end{vmatrix}$ is equal to

a) 1
b) 0
c) 4
d) 2

8) If A and B are square matrices of size n x n such that $A^2 - B^2 = (A - B)(A + B)$, then which of the following will be always true? [2006]

a) $A = B$
b) $AB = BA$
c) either of A or B is zero matrix
d) either of A or B is identity matrix

9) Let $\mathbf{A} = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ and $\mathbf{B} = \begin{pmatrix} a & 0 \\ 0 & b \end{pmatrix}$, a,b $\in$ N. Then [2006]

a) there cannot exist any B such that $AB = BA$
b) there exist more than one but finite number of B's such that $AB = BA$
c) there exists exactly one B such that $AB = BA$
d) there exist infinitely many B's such that $AB = BA$

10) If D= $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$ for $x \neq 0$, $y \neq 0$, then D is [2007]

a) divisible by x but not y
b) divisible by y but not x
c) divisible neither by x nor y
d) divisible by both x and y

11) Let A= $\begin{vmatrix} 5 & 5\alpha & \alpha \\ 0 & \alpha & 5\alpha \\ 0 & 0 & 5 \end{vmatrix}$. If $\left|A^2\right| = 25$,then $|\alpha|$ equals [2007]

  a) $\frac{1}{5}$
  b) 5
  c) 5^2
  d) 1

12) Let A be a 2x2 matrix with real entries. Let I be the 2x2 identity matrix. Denote by tr(A),the sum of diagonal entries of A. Assume that $A^2 = I$. [2008]
   Statement-1 : If $A \neq I$ and $A \neq -I$,then det(A)=-1
   Statement-2 : If $A \neq I$ and $A \neq -I$,then $tr(A) \neq 0$.

  a) Statement-1 is false, Statement-2 is true
  b) Statement-1 is true, Statement-2 is true;Statement-2 is a correct explanation for Statement-1
  c) Statement-1 is true, Statement-2 is true;Statement-2 is not a correct explanation for Statement-1
  d) Statement-1 is true, Statement-2 is false

13) Let a,b,c be any real numbers. Suppose that there are real numbers x,y,z not all zero such that $x = cy + bz$, $y = az + cx$, and $z = bx + ay$. Then $a^2 + b^2 + c^2 + 2abc$ is equal to [2008]

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

14) Let A be a square matrix all of whose entries are integers. Then which of the following is true? [2008]

  a) If $det(A) \neq \pm 1$, then A^{-1} exists but all its entries are not necessarily integers
  b) If $det(A) \neq \pm 1$, then A^{-1} exists and all its entries are non integers
  c) If $det(A) = \pm 1$, then A^{-1} exists but all its entries are integers
  d) If $det(A) = \pm 1$, then A^{-1} need not exists

15) Let A be a 2x2 matrix
   Statement-1:$adj(adjA) = A$
   Statement-2:$|adjA| = |A|$ [2009]

  a) Statement-1 is true, Statement-2 is true;Statement-2 is not a correct explanation for Statement-1
  b) Statement-1 is true, Statement-2 is false
  c) Statement-1 is false, Statement-2 is true
  d) Statement-1 is true, Statement-2 is true;Statement-2 is a correct explanation for Statement-1