Assignment 2

EE24BTECH11002 - Agamjot Singh

SECTION - B JEE MAIN/AIEEE

20) Let a, b, c be such that $b(a+c) \neq 0$ if

$$\begin{vmatrix} a & a+1 & a-1 \\ b & b+1 & b-1 \\ c & c-1 & c+1 \end{vmatrix} + \begin{vmatrix} a+1 & b+1 & c-1 \\ a-1 & b-1 & c+1 \\ (-1)^{n+2}a & (-1)^{n+1}b & (-1)^{n}c \end{vmatrix} = 0$$

, then the value of n is: (2009)

a) any even integer b) any odd integer

c) any integer d) zero

21) The number of 3×3 non-singular matrices with four entries as 1 and all other entries as 0, is (2010)

a) 5 b) 6

c) atleast 7 d) less than 4

22) Let A be a 2×2 matrix with non-zero entries and let $A^2 = I$, where I is 2×2 identity matrix. Define
$Tr(A)$- sum of diagonal elements of A and
$|A|$ - determinant of matrix A.
Statement - 1: $Tr(A) = 0$.
Statement - 2: $|A| = 1$
(2010)

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.

23) Consider the system of linear equations;

$$x_1 + 2x_2 + x_3 = 3$$
$$2x_1 + 3x_2 + x_3 = 3$$
$$3x_1 + 5x_2 + 2x_3 = 1$$

(2010)

a) exactly 3 solutions
b) a unique solution
c) no solution
d) infinite number of solutions

24) The number of values of k for which the linear equations $4x + ky + 2z = 0$, $kx + 4y + z = 0$ and $2x + 2y + z = 0$ possess a non zero solution is (2011)

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

25) Let A and B be two symmetrix matrices of order 3.
Statement - 1: $A(BA)$ and $(AB)A$ are symmetric matrices.
Statement - 2: AB is symmetric matrix if matrix multiplication of A with B is commutative.

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.

26) Let

$$A = \begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{pmatrix}$$

If u_1 and u_2 are column matrices such that

$$Au_1 = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$

and

$$Au_2 = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$

, then $u_1 + u_2$ is equal to: (2012)

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

27) Let P and Q be 3×3 matrices $P \neq Q$. If $P^3 = Q^3$ and $P^2Q = Q^2P$ then determinant of $\left(P^2+Q^2\right)$ is equal to (2012)

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

28) If

$$P=\begin{pmatrix}1 & \alpha & 3\\ 1 & 3 & 3\\ 2 & 4 & 4\end{pmatrix}$$

is the adjoint of a 3×3 matrix A and $|A| = 4$, then α is equal to: ($JEEM$2014)

a) 4 b) 11 c) 5 d) 0

29) If $\alpha,\beta \neq 0$ and $f(n) = \alpha^n + \beta^n$ and

$$\begin{vmatrix} 3 & 1+f(1) & 1+f(2)\\ 1+f(1) & 1+f(2) & 1+f(3)\\ 1+f(2) & 1+f(3) & 1+f(4)\end{vmatrix}$$

$= K(1-\alpha)^2(1-\beta)^2(\alpha-\beta)^2$, then K is equal to

($JEEM$2014)

a) 1 b) -1 c) $\alpha\beta$ d) $\frac{1}{\alpha\beta}$

30) If A is a 3×3 non-singular matrix such that $AA' = A'A$ and $B = A^{-1}A'$, then BB' equals: ($JEEM$2014)

a) B^{-1} b) $\left(B^{-1}\right)'$ c) $I+B$ d) I

31) The set of all values of λ for which the system of linear equations:

$$\begin{aligned} 2x_1 - 2x_2 + x_3 &= \lambda x_1\\ 2x_1 - 3x_2 + 2x_3 &= \lambda x_2\\ -x_1 + 2x_2 &= \lambda x_3\end{aligned}$$

has a non-trivial solution

($JEEM$2015)

a) contains two elements
b) contains more than two elements
c) is an empty set
d) is a singleton

32) If $A=\begin{pmatrix}1 & 2 & 2\\ 2 & 1 & -2\\ a & 2 & b\end{pmatrix}$ is a matrix satisfying the equation $AA^T = 9I$, where I is 3×3 identity matrix, then the ordered part (a,b) is equal to: ($JEEM$2015)

a) $(2,1)$ b) $(-2,-1)$

c) $(2,-1)$ d) $(-2,1)$

33) The system of linear equations

$$\begin{aligned} x+\lambda y - z &= 0\\ \lambda x - y - z &= 0\\ x + y - \lambda z &= 0\end{aligned}$$

has a non-trivial solution for:

($JEEM$2016)

a) exactly two values of λ
b) exactly three values of λ
c) inifinitely many values of λ
d) exactly one value of λ

34) If $A=\begin{pmatrix}5a & -b\\ 3 & 2\end{pmatrix}$ and $Aadj A = AA^T$, then $5a+b$ is equal to: ($JEEM$2016)

a) 4 b) 13

c) -1 d) 5

35) Let k be an integer such that triangle with vertices $(k,-3k)$, $(5,k)$, $(-k,2)$ has area 28 sq. units. Then the orthocentre of this triangle is at the point: ($JEEM$2017)

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

c) $\left(1,\frac{3}{4}\right)$ d) $\left(1,\frac{-3}{4}\right)$

36) Let ω be a complex number such that $2\omega+1 = z$ where $z = \sqrt{-3}$. If $\begin{vmatrix}1 & 1 & 1\\ 1 & -\omega^2-1 & \omega^2\\ 1 & \omega^2 & \omega^7\end{vmatrix} = 3k$, then k is equal to: ($JEEM$2017)

(a) 1 (b) $-z$

(c) z (d) -1