

Assignment 2

EE24BTECH11002 - Agamjot Singh

SECTION - B JEE MAIN/AIEEE

(2010)

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;

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

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

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

- 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 symmetric 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 $(P^2 + Q^2)$ 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: (JEEM2014)

- 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

(JEEM2014)

- 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: (JEEM2014)

- a) B^{-1} b) $(B^{-1})'$ 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

(JEEM2015)

- 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: (JEEM2015)

- 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:

(JEEM2016)

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

34) If

$$A = \begin{pmatrix} 5a & -b \\ 3 & 2 \end{pmatrix}$$

and $A \text{adj} A = AA^T$, then $5a + b$ is equal to: (JEEM2016)

- 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: (JEEM2017)

- a) $(2, \frac{1}{2})$ b) $(2, \frac{-1}{2})$
c) $(1, \frac{3}{4})$ d) $(1, \frac{-3}{4})$

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: (JEEM2017)

(a) 1

(b) $-z$

(c) z

(d) -1