1. The inverse of the matrix $\begin{bmatrix}1 & 0 & 0\\0 & 1 & 0\\0 & 0 & 1\end{bmatrix}$ is

[MP PET 1989; Pb. CET 1989, 1993]

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

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

2. The inverse of $\begin{bmatrix}2 & -3\\-4 & 2\end{bmatrix}$ is

[MP PET 1993; Pb. CET 2000]

(a) $\frac{-1}{8}\begin{bmatrix}2 & 3\\4 & 2\end{bmatrix}$ (b) $\frac{-1}{8}\begin{bmatrix}3 & 2\\2 & 4\end{bmatrix}$

(c) $\frac{1}{8}\begin{bmatrix}2 & 3\\4 & 2\end{bmatrix}$ (d) $\frac{1}{8}\begin{bmatrix}3 & 2\\2 & 4\end{bmatrix}$

3. If $A=\begin{bmatrix}\cos\alpha & \sin\alpha\\-\sin\alpha & \cos\alpha\end{bmatrix}$ and $A\ adj\ A=\begin{bmatrix}k & 0\\0 & k\end{bmatrix}$, then k is equal to **[MP PET 1993; Pb. CET 2001]**

(a) 0 (b) 1

(c) $\sin\alpha\cos\alpha$ (d) $\cos 2\alpha$

4. If a matrix A is such that $3A^3+2A^2+5A+I=0$, then its inverse is

(a) $-(3A^2+2A+5I)$ (b) $3A^2+2A+5I$

(c) $3A^2-2A-5I$ (d) None of these

5. If A and B are square matrices of the same order, then **[Pb. CET 1992; Roorkee 1995]**

(a) $(AB)'=A'B'$

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

(c) $AB=O$, If $|A|=0$ or $|B|=0$

(d) $AB=O$, If $A=I$ or $B=I$

6. Which one of the following statements is true **[MP PET 1996]**

(a) Non- singular square matrix does not have a unique inverse

(b) Determinant of a non-singular matrix is zero

(c) If $A'=A$, then A is a square matrix

(d) If $|A|\neq 0$, then $|A.adjA|=|A|^{(n-1)}$, where $A=[a_{ij}]_{n\times n}$

7. If matrix $A=\begin{bmatrix}1 & -1\\1 & 1\end{bmatrix}$, then **[MP PET 1996]**

(a) $A'=\begin{bmatrix}1 & 1\\1 & -1\end{bmatrix}$

(b) $A^{-1}=\begin{bmatrix}1 & 1\\-1 & 1\end{bmatrix}$

(c) $A.\begin{bmatrix}1 & 1\\-1 & 1\end{bmatrix}=2I$

(d) $\lambda A=\begin{bmatrix}\lambda & -\lambda\\1 & -1\end{bmatrix}$ where λ is a non zero scalar

8. Which of the following is not true **[Kurukshetra CEE 1996]**

(a) Every skew-symmetric matrix of odd order is non-singular

(b) If determinant of a square matrix is non-zero, then it is non singular

(c) Adjoint of symmetric matrix is symmetric

(d) Adjoint of a diagonal matrix is diagonal

9. $Adj.(AB)-(Adj.B)(Adj.A)=$ **[MP PET 1997]**

(a) $Adj A-Adj B$ (b) I

(c) O (d) None of these

10. If $A=\begin{pmatrix}3 & 2\\0 & 1\end{pmatrix}$, then $(A^{-1})^3$ is equal to

[MP PET 1997; Pb. CET 2003]

(a) $\frac{1}{27}\begin{pmatrix}1 & -26\\0 & 27\end{pmatrix}$ (b) $\frac{1}{27}\begin{pmatrix}-1 & 26\\0 & 27\end{pmatrix}$

(c) $\frac{1}{27}\begin{pmatrix}1 & -26\\0 & -27\end{pmatrix}$ (d) $\frac{1}{27}\begin{pmatrix}-1 & -26\\0 & -27\end{pmatrix}$

11. If $A=\begin{bmatrix}3 & -3 & 4\\2 & -3 & 4\\0 & -1 & 1\end{bmatrix}$, then $A^{-1}=$ **[DCE 1999]**

(a) A (b) A^2

(c) A^3 (d) A^4

12. The element in the first row and third column of the inverse of the matrix $\begin{bmatrix}1 & 2 & -3\\0 & 1 & 2\\0 & 0 & 1\end{bmatrix}$ is

(a) – 2 (b) 0

(c) 1 (d) 7

13. For any square matrix A, AA^T is a **[RPET 2000]**

(a) Unit matrix (b) Symmetric matrix

(c) Skew symmetric matrix (d) Diagonal matrix

14. If $A=\begin{bmatrix}\cos\theta & -\sin\theta\\\sin\theta & \cos\theta\end{bmatrix}$, then which of the following statements is not correct **[DCE 2001]**

(a) A is orthogonal matrix (b) A' is orthogonal matrix

(c) Determinant A = 1 (d) A is not invertible

15. If $A^2-A+I=0$, then $A^{-1}=$

[Kerala (Engg,) 2001; AIEEE 2005]

(a) A^{-2} (b) $A+I$

(c) $I-A$ (d) $A-I$

16. For two invertible matrices A and B of suitable orders, the value of $(AB)^{-1}$ is

[Pb. CET 2000, RPET 2000, 02; Karnataka CET 2001]

(a) $(BA)^{-1}$ (b) $B^{-1}A^{-1}$

(c) $A^{-1}B^{-1}$ (d) $(AB)^{-1}$

17. If $A=\begin{bmatrix}-1 & 2\\2 & -1\end{bmatrix}$ and $B=\begin{bmatrix}3\\1\end{bmatrix}$, $AX=B$, then $X=$

[MP PET 2002]

(a) $[5\ 7]$ (b) $\frac{1}{3}\begin{bmatrix}5\\7\end{bmatrix}$

(c) $\frac{1}{3}[5\ 7]$ (d) $\begin{bmatrix}5\\7\end{bmatrix}$

18. If $A=\begin{bmatrix}1 & 2\\3 & -5\end{bmatrix}$, then $A^{-1}=$ **[MP PET 2002]**

(a) $\begin{bmatrix} -5 & -2 \\ -3 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} \frac{5}{11} & \frac{2}{11} \\ \frac{3}{11} & -\frac{1}{11} \end{bmatrix}$

(c) $\begin{bmatrix} -\frac{5}{11} & -\frac{2}{11} \\ -\frac{3}{11} & -\frac{1}{11} \end{bmatrix}$ (d) $\begin{bmatrix} 5 & 2 \\ 3 & -1 \end{bmatrix}$

19. The adjoint matrix of $\begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$ is **[MP PET 2003]**

(a) $\begin{bmatrix} 4 & 8 & 3 \\ 2 & 1 & 6 \\ 0 & 2 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & -1 & 0 \\ -2 & 3 & -4 \\ -2 & 3 & -3 \end{bmatrix}$

(c) $\begin{bmatrix} 11 & 9 & 3 \\ 1 & 2 & 8 \\ 6 & 9 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & -2 & 1 \\ -1 & 3 & 3 \\ -2 & 3 & -3 \end{bmatrix}$

20. The inverse matrix of $\begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$, is **[MP PET 2003]**

(a) $\begin{bmatrix} \frac{1}{2} & -\frac{1}{2} & \frac{1}{2} \\ -4 & 3 & -1 \\ \frac{5}{2} & \frac{-3}{2} & \frac{1}{2} \end{bmatrix}$ (b) $\begin{bmatrix} \frac{1}{2} & -4 & \frac{5}{2} \\ 1 & -6 & 3 \\ 1 & 2 & -1 \end{bmatrix}$

(c) $\frac{1}{2}\begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \\ 4 & 2 & 3 \end{bmatrix}$ (d) $\frac{1}{2}\begin{bmatrix} 1 & -1 & -1 \\ -8 & 6 & -2 \\ 5 & -3 & 1 \end{bmatrix}$

21. The multiplicative inverse of matrix $\begin{bmatrix} 2 & 1 \\ 7 & 4 \end{bmatrix}$ is **[DCE 2002]**

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

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

22. If $A = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$, then $A^{-1} =$ **[MP PET 2004]**

(a) I (b) $-I$
(c) $-A$ (d) A

23. Let $A = \begin{pmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{pmatrix}$ and $(10)B = \begin{pmatrix} 4 & 2 & 2 \\ -5 & 0 & \alpha \\ 1 & -2 & 3 \end{pmatrix}$. If B is the inverse of matrix A, then α is

(a) 5 (b) -1
(c) 2 (d) -2

24. For any 2×2 matrix A, if $A(adj A) = \begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix}$ then $|A|$ is equal **[Pb. CET 2002]**

(a) 0 (b) 10
(c) 20 (d) 100

25. $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & -2 & 4 \end{bmatrix}$; $I = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ $A^{-1} = \frac{1}{6}[A^2 + cA + dI]$ where $c, d \in R$, then pair of values (c, d) **[IIT Screening 2005]**

(a) (6, 11) (b) (6, –11)
(c) (–6, 11) (d) (–6, –11)

26. If $P = \begin{bmatrix} \frac{\sqrt{3}}{2} & \frac{1}{2} \\ -\frac{1}{2} & \frac{\sqrt{3}}{2} \end{bmatrix}$, $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ and $Q = PAP^T$, then $P(Q^{2005})P^T$ equal to **[IIT Screening 2005]**

(a) $\begin{bmatrix} 1 & 2005 \\ 0 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} \sqrt{3}/2 & 2005 \\ 1 & 0 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & 2005 \\ \sqrt{3}/2 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & \sqrt{3}/2 \\ 0 & 2005 \end{bmatrix}$

27. If A is a unit matrix of order n, then $A(adj A)$ is **[DCE 2005]**

(a) Zero matrix (b) Row matrix
(c) Unit matrix (d) None of these

28. If A is a skew-symmetric matrix of order n, and C is a column matrix of order $n \times 1$, then $C^T AC$ is **[AMU 2005]**

(a) A Identity matrix of order n
(b) A unit matrix of order one
(c) A zero matrix of order one
(d) None of these

29. If A is a square matrix of order 3, then the true statement is (where I is unit matrix) **[MP PET 1992]**

(a) $\det(-A) = -\det A$ (b) $\det A = 0$
(c) $\det(A + I) = 1 + \det A$ (d) $\det 2A = 2\det A$

30. f $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 3 \\ 0 & 0 & 2 \end{bmatrix}$, then $|AB|$ is equal to **[RPET 1995]**

(a) 4 (b) 8
(c) 16 (d) 32

31. If A and B are square matrices of order 3 such that $|A| = -1$, $|B| = 3$, then $|3AB| =$ **[IIT 1988; MP PET 1995, 99]**

(a) -9 (b) -81
(c) -27 (d) 81

32. The number of solution of the following equations $x_2 - x_3 = 1$, $-x_1 + 2x_3 = -2$, $x_1 - 2x_2 = 3$ is **[MP PET 2000]**

(a) Zero (b) One
(c) Two (d) Infinite

33. If $A = \begin{bmatrix} \alpha & 2 \\ 2 & \alpha \end{bmatrix}$ and $|A^3| = 125$, then $\alpha =$ **[IIT Screening 2004]**

(a) ± 3 (b) ± 2
(c) ± 5 (d) 0

34. If $\begin{bmatrix} 1 & 1 & 1 \\ 1 & -2 & -2 \\ 1 & 3 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 3 \\ 4 \end{bmatrix}$, then $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$ is equal to **[MP PET 2004]**

(a) $\begin{bmatrix}1\\1\\1\end{bmatrix}$ (b) $\begin{bmatrix}1\\-2\\3\end{bmatrix}$

(c) $\begin{bmatrix}1\\-2\\1\end{bmatrix}$ (d) $\begin{bmatrix}1\\2\\-3\end{bmatrix}$

35. If $A \neq O$ and $B \neq O$ are $n \times n$ matrix such that $AB = O$, then **[Orissa JEE 2002]**

(a) $Det(A) = 0$ or $Det(B) = 0$

(b) $Det(A) = 0$ and $Det(B) = 0$

(c) $Det(A) = Det(B) \neq 0$

(d) $A^{-1} = B^{-1}$

36. If $A = \begin{bmatrix} a & b \\ b & a \end{bmatrix}$ and $A^2 = \begin{bmatrix} \alpha & \beta \\ \beta & \alpha \end{bmatrix}$, then **[AIEEE 2003]**

(a) $\alpha = a^2 + b^2, \beta = ab$ (b) $\alpha = a^2 + b^2, \beta = 2ab$

(c) $\alpha = a^2 + b^2, \beta = a^2 - b^2$ (d) $\alpha = 2ab, \beta = a^2 + b^2$

37. If $a \neq p, b \neq q, c \neq r$ and $\begin{vmatrix} p & b & c \\ p+a & q+b & 2c \\ a & b & r \end{vmatrix} = 0$, then

$\frac{p}{p-a} + \frac{q}{q-b} + \frac{r}{r-c} =$ **[EAMCET 2003]**

(a) 3 (b) 2

(c) 1 (d) 0

(c) Dependent on a, c and independent of b, d

(d) None of these

38. If $n \neq 3k$ and 1, ω, ω^2 are the cube roots of unity, then $\Delta = \begin{vmatrix} 1 & \omega^n & \omega^{2n} \\ \omega^{2n} & 1 & \omega^n \\ \omega^n & \omega^{2n} & 1 \end{vmatrix}$ has the value

[Pb. CET 1991; RPET 2001]

(a) 0 (b) ω

(c) ω^2 (d) 1

39. In a ΔABC, if $\begin{vmatrix} 1 & a & b \\ 1 & c & a \\ 1 & b & c \end{vmatrix} = 0$, then

$\sin^2 A + \sin^2 B + \sin^2 C =$ **[Karnataka CET 2003]**

(a) $\frac{9}{4}$ (b) $\frac{4}{9}$

(c) 1 (d) $3\sqrt{3}$

40. For positive numbers x, y and z the numerical value of the determinant $\begin{vmatrix} 1 & \log_x y & \log_x z \\ \log_y x & 1 & \log_y z \\ \log_z x & \log_z y & 1 \end{vmatrix}$ is

[IIT 1993; UPSEAT 2002]

(a) 0 (b) 1

(c) $\log_e xyz$ (d) None of these

41. l, m, n are the p^{th}, q^{th} and r^{th} term of a G.P., all positive, then $\begin{vmatrix} \log l & p & 1 \\ \log m & q & 1 \\ \log n & r & 1 \end{vmatrix}$ equals **[AIEEE 2002]**

(a) -1 (b) 2

(c) 1 (d) 0

42. If $x = cy + bz$, $y = az + cx$, $z = bx + ay$ (where x, y, z are not all zero) have a solution other than $x = 0$, $y = 0$, $z = 0$ then a, b and c are connected by the relation

[IIT 1978; MP PET 1998]

(a) $a^2 + b^2 + c^2 + 3abc = 0$

(b) $a^2 + b^2 + c^2 + 2abc = 0$

(c) $a^2 + b^2 + c^2 + 2abc = 1$

(d) $a^2 + b^2 + c^2 - bc - ca - ab = 1$

43. If $|A|$ denotes the value of the determinant of the square matrix A of order 3, then $|-2A| =$

[MP PET 1987, 89, 92, 2000]

(a) $-8|A|$ (b) $8|A|$

(c) $-2|A|$ (d) None of these

44. If the system of equations $ax + y + z = 0$, $x + by + z = 0$ and $x + y + cz = 0$, where $a, b, c \neq 1$, has a non trivial solution, then the value of $\frac{1}{1-a} + \frac{1}{1-b} + \frac{1}{1-c}$ is **[Orissa JEE 2005]**

(a) -1 (b) 0

(c) 1 (d) None of these

45. If A is a matrix of order 3 and $|A| = 8$, then $|adj A| =$

[DCE 1999; Karnataka CET 2002]

(a) 1 (b) 2

(c) 2^3 (d) 2^6

46. The rank of the matrix $\begin{bmatrix} -1 & 2 & 5 \\ 2 & -4 & a-4 \\ 1 & -2 & a+1 \end{bmatrix}$ is

[Roorkee Qualifying 1998]

(a) 1 if $a = 6$ (b) 2 if $a = 1$

(c) 3 If $a = 2$ (d) 1 if $a = -6$

47. If $A = \begin{bmatrix} 1 & \tan\theta/2 \\ -\tan\theta/2 & 1 \end{bmatrix}$ and $AB = I$, then $B =$

[MP PET 1995, 98]

(a) $\cos^2 \frac{\theta}{2}.A$ (b) $\cos^2 \frac{\theta}{2}.A^T$

(c) $\cos^2 \frac{\theta}{2}.I$ (d) None of these

48. If $3X + 2Y = I$ and $2X - Y = O$, where I and O are unit and null matrices of order 3 respectively, then

[MP PET 1995]

(a) $X = (1/7), Y = (2/7)$ (b) $X = (2/7), Y = (1/7)$

(c) $X = (1/7)I, Y = (2/7)I$ (d) $X = (2/7)I, Y = (1/7)I$

ANSWERSHEET:

1.b 2.a 3.b 4.a 5.b 6. c 7.c 8.a 9.c 10.a

11.c 12.d 13.b 14.d 15.c 16.b 17.b 18.b

19.b 20.a 21.d 22.d 23. a 24.b 25.c

26.a 27. a 28.b 29.a 30.c 31.b 32.a

33.a 34.d 35. a 36.b 37.b 38.a 39.a 40.a 41.d 42.c 43.a 44.c 45.d 46.b,d 47.b 48.c