ASSIGNMENT ON DETERMINANTS

1. $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} =$ **[Pb. CET 1997; DCE 2002]**

(a) $a^2+b^2+c^2$ (b) $(a+b)(b+c)(c+a)$

(c) $(a-b)(b-c)(c-a)$ (d) None of these

2. The roots of the equation $\begin{vmatrix} 1 & 4 & 20 \\ 1 & -2 & 5 \\ 1 & 2x & 5x^2 \end{vmatrix} = 0$ are

[IIT 1987; MP PET 2002]

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

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

3. $\begin{vmatrix} 1 & 5 & \pi \\ \log_e e & 5 & \sqrt{5} \\ \log_{10} 10 & 5 & e \end{vmatrix} =$

(a) $\sqrt{\pi}$ (b) e

(c) 1 (d) 0

4. If $a \neq b \neq c$, the value of x which satisfies the equation $\begin{vmatrix} 0 & x-a & x-b \\ x+a & 0 & x-c \\ x+b & x+c & 0 \end{vmatrix} = 0$, is

[EAMCET 1988; Karnataka CET 1991; MNR 1980; MP PET 1988, 99, 2001; DCE 2001]

(a) $x = 0$ (b) $x = a$

(c) $x = b$ (d) $x = c$

5. If ω is the cube root of unity, then $\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{vmatrix} =$

[RPET 1985, 93, 94; MP PET 1990, 2002; Karnataka CET 1992; 93, 02, 05]

(a) 1 (b) 0

(c) ω (d) ω^2

6. If $a+b+c=0$, then the solution of the equation $\begin{vmatrix} a-x & c & b \\ c & b-x & a \\ b & a & c-x \end{vmatrix} = 0$ is **[UPSEAT 2001]**

(a) 0 (b) $\pm\frac{3}{2}(a^2+b^2+c^2)$

(c) $0, \pm\sqrt{\frac{3}{2}(a^2+b^2+c^2)}$ (d) $0, \pm\sqrt{a^2+b^2+c^2}$

7. $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} =$ **[RPET 1990, 95]**

(a) $(a+b+c)^2$ (b) $(a+b+c)^3$

(c) $(a+b+c)(ab+bc+ca)$ (d) None of these

8. $\begin{vmatrix} a+b & a+2b & a+3b \\ a+2b & a+3b & a+4b \\ a+4b & a+5b & a+6b \end{vmatrix} =$

[IIT 1986; MNR 1985; MP PET 1998; Pb. CET 2003]

(a) $a^2+b^2+c^2-3abc$ (b) $3ab$

(c) $3a+5b$ (d) 0

9. $\begin{vmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{vmatrix} =$

[Roorkee 1980; RPET 1997, 99; KCET 1999; MP PET 2001]

(a) abc (b) $2abc$

(c) $3abc$ (d) $4abc$

10. The roots of the equation $\begin{vmatrix} 1+x & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+x \end{vmatrix} = 0$ are

[MP PET 1989; Roorkee Qualifying 1998]

(a) $0, -3$ (b) $0, 0, -3$

(c) $0, 0, 0, -3$ (d) None of these

11. One of the roots of the given equation $\begin{vmatrix} x+a & b & c \\ b & x+c & a \\ c & a & x+b \end{vmatrix} = 0$ is

[MP PET 1988, 2002; RPET 1996]

(a) $-(a+b)$ (b) $-(b+c)$

(c) $-a$ (d) $-(a+b+c)$

12. $\begin{vmatrix} x+1 & x+2 & x+4 \\ x+3 & x+5 & x+8 \\ x+7 & x+10 & x+14 \end{vmatrix} =$ **[MNR 1985; UPSEAT 2000]**

(a) 2 (b) -2

(c) x^2-2 (d) None of these

13. $\begin{vmatrix} b^2-ab & b-c & bc-ac \\ ab-a^2 & a-b & b^2-ab \\ bc-ac & c-a & ab-a^2 \end{vmatrix} =$ **[MNR 1988]**

(a) $abc(a+b+c)$

(b) $3a^2b^2c^2$

(c) 0

(d) None of these

14. $\begin{vmatrix} 1/a & a^2 & bc \\ 1/b & b^2 & ca \\ 1/c & c^2 & ab \end{vmatrix} =$ **[RPET 1990, 99]**

(a) abc (b) $1/abc$

(c) $ab+bc+ca$ (d) 0

15. $\begin{vmatrix} b^2+c^2 & a^2 & a^2 \\ b^2 & c^2+a^2 & b^2 \\ c^2 & c^2 & a^2+b^2 \end{vmatrix} =$ **[IIT 1980]**

(a) abc (b) $4abc$

(c) $4a^2b^2c^2$ (d) $a^2b^2c^2$

16. $\begin{vmatrix} 1+x & 1 & 1 \\ 1 & 1+y & 1 \\ 1 & 1 & 1+z \end{vmatrix} =$ **[RPET 1992; Kerala (Engg.) 2002]**

(a) $xyz\left(1+\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)$ (b) xyz

(c) $1+\frac{1}{x}+\frac{1}{y}+\frac{1}{z}$ (d) $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}$

17. If ω is a cube root of unity, then $\begin{vmatrix} x+1 & \omega & \omega^2 \\ \omega & x+\omega^2 & 1 \\ \omega^2 & 1 & x+\omega \end{vmatrix} =$

[MNR 1990; MP PET 1999]

(a) x^3+1 (b) $x^3+\omega$

(c) $x^3+\omega^2$ (d) x^3

18. If $\begin{vmatrix} y+z & x & y \\ z+x & z & x \\ x+y & y & z \end{vmatrix} = k(x+y+z)(x-z)^2$, then $k=$

(a) $2xyz$ (b) 1

(c) xyz (d) $x^2y^2z^2$

19. If -9 is a root of the equation $\begin{vmatrix} x & 3 & 7 \\ 2 & x & 2 \\ 7 & 6 & x \end{vmatrix} = 0$ then the other two roots are

[IIT 1983; MNR 1992; MP PET 1995; DCE 1997; UPSEAT 2001]

(a) 2, 7 (b) -2, 7

(c) 2, -7 (d) -2, -7

20. If a, b, c are unequal what is the condition that the value of the following determinant is zero $\Delta = \begin{vmatrix} a & a^2 & a^3+1 \\ b & b^2 & b^3+1 \\ c & c^2 & c^3+1 \end{vmatrix}$

[IIT 1985; DCE 1999]

(a) $1+abc=0$ (b) $a+b+c+1=0$

(c) $(a-b)(b-c)(c-a)=0$ (d) None of these

21. If $p\lambda^4+q\lambda^3+r\lambda^2+s\lambda+t = \begin{vmatrix} \lambda^2+3\lambda & \lambda-1 & \lambda+3 \\ \lambda+1 & 2-\lambda & \lambda-4 \\ \lambda-3 & \lambda+4 & 3\lambda \end{vmatrix}$, the value of t is **[IIT 1981]**

(a) 16 (b) 18

(c) 17 (d) 19

22. The value of the determinant $\begin{vmatrix} 4 & -6 & 1 \\ -1 & -1 & 1 \\ -4 & 11 & -1 \end{vmatrix}$ is

[RPET 1992]

(a) -75 (b) 25

(c) 0 (d) -25

23. The value of the determinant $\begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix}$ is

[MP PET 1993; Karnataka CET 1994; Pb. CE 2004]

(a) $a+b+c$ (b) $(a+b+c)^2$

(c) 0 (d) $1+a+b+c$

24. If a, b and c are non zero numbers, then

$\Delta = \begin{vmatrix} b^2c^2 & bc & b+c \\ c^2a^2 & ca & c+a \\ a^2b^2 & ab & a+b \end{vmatrix}$ is equal to

[AMU 1992; Karnataka CET 2000; 03]

(a) abc (b) $a^2b^2c^2$

(c) $ab+bc+ca$ (d) None of these

25. The determinant $\begin{vmatrix} a & b & a\alpha+b \\ b & c & b\alpha+c \\ a\alpha+b & b\alpha+c & 0 \end{vmatrix} = 0$, if a, b, c are in

[IIT 1986, 97; MNR 1992; DCE 2000, 01; UPSEAT 2002]

(a) A. P. (b) G. P.

(c) H. P. (d) None of these

26. $\begin{vmatrix} a+b & b+c & c+a \\ b+c & c+a & a+b \\ c+a & a+b & b+c \end{vmatrix} = K \begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$, then $K=$

[EAMCET 1992; DCE 2000]

(a) 1 (b) 2

(c) 3 (d) 4

27. $\begin{vmatrix} 0 & p-q & p-r \\ q-p & 0 & q-r \\ r-p & r-q & 0 \end{vmatrix} =$ **[EAMCET 1993]**

(a) 0 (b) $(p-q)(q-r)(r-p)$

(c) pqr (d) $3pqr$

28. A root of the equation $\begin{vmatrix} 3-x & -6 & 3 \\ -6 & 3-x & 3 \\ 3 & 3 & -6-x \end{vmatrix} = 0$ is

[Roorkee 1991; RPET 2001; J & K 2005]

(a) 6 (b) 3

(c) 0 (d) None of these

29. The value of $\begin{vmatrix} a & a+b & a+2b \\ a+2b & a & a+b \\ a+b & a+2b & a \end{vmatrix}$ is equal to

[Kerala (Engg.) 2001]

(a) $9a^2(a+b)$ (b) $9b^2(a+b)$

(c) $a^2(a+b)$ (d) $b^2(a+b)$

30. If $\begin{vmatrix} -a^2 & ab & ac \\ ab & -b^2 & bc \\ ac & bc & -c^2 \end{vmatrix} = Ka^2b^2c^2$, then $K=$

[Kurukshetra CEE 1996, 98, 2002; RPET 1997; MP PET 1998, 99; Tamilnadu (Engg.) 2002]

(a) -4 (b) 2

(c) 4 (d) 8

31. $\begin{vmatrix} 1 & 1+ac & 1+bc \\ 1 & 1+ad & 1+bd \\ 1 & 1+ae & 1+be \end{vmatrix} =$ **[MP PET 1996]**

(a) 1 (b) 0

(c) 3 (d) $a+b+c$

32. If $\begin{vmatrix} a & b & a\alpha-b \\ b & c & b\alpha-c \\ 2 & 1 & 0 \end{vmatrix} = 0$ and $\alpha \neq \frac{1}{2}$, then **[MP PET 1998]**

(a) a, b, c are in A. P. (b) a, b, c are in G. P.

(c) a, b, c are in H. P. (d) None of these

33. If $a^{-1}+b^{-1}+c^{-1}=0$ such that $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = \lambda$, then the value of λ is **[RPET 2000]**

(a) 0 (b) abc

(c) $-abc$ (d) None of these

[AMU 2000]

34. At what value of x, will $\begin{vmatrix} x+\omega^2 & \omega & 1 \\ \omega & \omega^2 & 1+x \\ 1 & x+\omega & \omega^2 \end{vmatrix} = 0$

[DCE 2000, 01]

(a) $x = 0$ (b) $x = 1$

(c) $x = -1$ (d) None of these

35. Let $\omega = -\frac{1}{2} + i\frac{\sqrt{3}}{2}$. Then the value of the determinant $\begin{vmatrix} 1 & 1 & 1 \\ 1 & -1-\omega^2 & \omega^2 \\ 1 & \omega^2 & \omega^4 \end{vmatrix}$ is **[IIT Screening 2002]**

(a) 3ω (b) $3\omega(\omega-1)$

(c) $3\omega^2$ (d) $3\omega(1-\omega)$

36. If $\begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix} = kabc(a+b+c)^3$, then the value of k is **[Tamilnadu (Engg.) 2001]**

(a) -1 (b) 1

(c) 2 (d) -2

37. If A, B, C be the angles of a triangle, then $\begin{vmatrix} -1 & \cos C & \cos B \\ \cos C & -1 & \cos A \\ \cos B & \cos A & -1 \end{vmatrix} =$ **[Karnataka CET 2002]**

(a) 1 (b) 0

(c) $\cos A \cos B \cos C$ (d) $\cos A + \cos B \cos C$

38. $\begin{vmatrix} 1 & 1 & 1 \\ 1 & \omega^2 & \omega \\ 1 & \omega & \omega^2 \end{vmatrix} =$ **[RPET 2002]**

(a) $3\sqrt{3}i$ (b) $-3\sqrt{3}i$

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

39. $\begin{vmatrix} (a^x+a^{-x})^2 & (a^x-a^{-x})^2 & 1 \\ (b^x+b^{-x})^2 & (b^x-b^{-x})^2 & 1 \\ (c^x+c^{-x})^2 & (c^x-c^{-x})^2 & 1 \end{vmatrix} =$ **[UPSEAT 2002; AMU 2005]**

(a) 0 (b) $2abc$

(c) $a^2b^2c^2$ (d) None of these

40. The values of x in the following determinant equation, $\begin{vmatrix} a+x & a-x & a-x \\ a-x & a+x & a-x \\ a-x & a-x & a+x \end{vmatrix} = 0$ are **[MP PET 2003]**

(a) $x = 0, x = 4a$ (b) $x = 0, x = a$

(c) $x = 0, x = 2a$ (d) $x = 0, x = 3a$

41. If ω is an imaginary root of unity, then the value of $\begin{vmatrix} a & b\omega^2 & a\omega \\ b\omega & c & b\omega^2 \\ c\omega^2 & a\omega & c \end{vmatrix}$ is **[MP PET 2004]**

(a) $a^3+b^3+c^3-3abc$ (b) a^2b-b^2c

(c) 0 (d) $a^2+b^2+c^2$

42. The value of $\begin{vmatrix} 1 & 1 & 1 \\ bc & ca & ab \\ b+c & c+a & a+b \end{vmatrix}$ is **[Karnataka CET 2004]**

(a) 1 (b) 0

(c) $(a-b)(b-c)(c-a)$ (d) $(a+b)(b+c)(c+a)$

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

(a) 3 (b) 2

(c) 1 (d) 0

44. The value of the determinant $\begin{vmatrix} 0 & b^3-a^3 & c^3-a^3 \\ a^3-b^3 & 0 & c^3-b^3 \\ a^3-c^3 & b^3-c^3 & 0 \end{vmatrix}$ is equal to **[J & K 2005]**

(a) $a^3+b^3+c^3$ (b) $a^3-b^3-c^3$

(c) 0 (d) $-a^3+b^3+c^3$

45. $\begin{vmatrix} 1+\sin^2\theta & \sin^2\theta & \sin^2\theta \\ \cos^2\theta & 1+\cos^2\theta & \cos^2\theta \\ 4\sin 4\theta & 4\sin 4\theta & 1+4\sin 4\theta \end{vmatrix} = 0$ then $\sin 4\theta$ equal to

[Orissa JEE 2005]

(a) 1/2 (b) 1

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

46. The following system of equation $3x-2y+z=0$, $\lambda x-14y+15z=0$, $x+2y-3z=0$ has a solution other than $x=y=z=0$ for λ equal to

(a) 1 (b) 2

(c) 3 (d) 5

47. $x+ky-z=0, 3x-ky-z=0$ and $x-3y+z=0$ has non-zero solution for $k =$ **[IIT 1988]**

(a) -1 (b) 0

(c) 1 (d) 2

48. If $x+y-z=0, 3x-\alpha y-3z=0, x-3y+z=0$ has non zero solution, then $\alpha =$ **[MP PET 1990]**

(a) -1 (b) 0

(c) 1 (d) -3

49. The number of solutions of the equations $x+4y-z=0$, $3x-4y-z=0, x-3y+z=0$ is **[MP PET 1992]**

(a) 0 (b) 1

(c) 2 (d) Infinite

50. If $\Delta(x) = \begin{vmatrix} x^n & \sin x & \cos x \\ n! & \sin\frac{n\pi}{2} & \cos\frac{n\pi}{2} \\ a & a^2 & a^3 \end{vmatrix}$, then the value of $\frac{d^n}{dx^n}[\Delta(x)]$ at $x=0$ is

(a) -1 (b) 0

(c) 1 (d) Dependent of a

ANSWERSHEET:

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