

## CHAPTER 3 & 4

### MATRICES AND DETERMINANTS

#### VERY SHORT ANSWER TYPE QUESTIONS (1 Mark)

1. If  $\begin{bmatrix} x+3 & 4 \\ y-4 & x+y \end{bmatrix} = \begin{bmatrix} 5 & 4 \\ 3 & 9 \end{bmatrix}$ , find  $x$  and  $y$ .
2. If  $A = \begin{bmatrix} i & 0 \\ 0 & -i \end{bmatrix}$  and  $B = \begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix}$ , find  $AB$ .
3. Find the value of  $a_{23} + a_{32}$  in the matrix  $A = [a_{ij}]_{3 \times 3}$   
where  $a_{ij} = \begin{cases} |2i - j| & \text{if } i > j \\ -i + 2j + 3 & \text{if } i \leq j \end{cases}$ .
4. If  $B$  be a  $4 \times 5$  type matrix, then what is the number of elements in the third column.
5. If  $A = \begin{bmatrix} 5 & 2 \\ 0 & 9 \end{bmatrix}$  and  $B = \begin{bmatrix} 3 & 6 \\ 0 & -1 \end{bmatrix}$  find  $3A - 2B$ .
6. If  $A = \begin{bmatrix} 2 & -3 \\ -7 & 5 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & 0 \\ 2 & -6 \end{bmatrix}$  find  $(A+B)'$ .
7. If  $A = [1 \ 0 \ 4]$  and  $B = \begin{bmatrix} 2 \\ 5 \\ 6 \end{bmatrix}$  find  $AB$ .
8. If  $A = \begin{bmatrix} 4 & x+2 \\ 2x-3 & x+1 \end{bmatrix}$  is symmetric matrix, then find  $x$ .
9. For what value of  $x$  the matrix  $\begin{bmatrix} 0 & 2 & -3 \\ -2 & 0 & -4 \\ 3 & 4 & x+5 \end{bmatrix}$  is skew symmetric matrix.
10. If  $A = \begin{bmatrix} 2 & 3 \\ 1 & 0 \end{bmatrix} = P + Q$  where  $P$  is symmetric and  $Q$  is skew-symmetric matrix, then find the matrix  $Q$ .

11. Find the value of  $\begin{vmatrix} a + ib & c + id \\ -c + id & a - ib \end{vmatrix}$
12. If  $\begin{vmatrix} 2x + 5 & 3 \\ 5x + 2 & 9 \end{vmatrix} = 0$ , find  $x$ .
13. For what value of  $k$ , the matrix  $\begin{bmatrix} k & 2 \\ 3 & 4 \end{bmatrix}$  has no inverse.
14. If  $A = \begin{bmatrix} \sin 30^\circ & \cos 30^\circ \\ -\sin 60^\circ & \cos 60^\circ \end{bmatrix}$ , what is  $|A|$ .
15. Find the cofactor of  $a_{12}$  in  $\begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$ .
16. Find the minor of  $a_{23}$  in  $\begin{vmatrix} 1 & 3 & -2 \\ 4 & -5 & 6 \\ 3 & 5 & 2 \end{vmatrix}$ .
17. Find the value of  $P$ , such that the matrix  $\begin{bmatrix} -1 & 2 \\ 4 & P \end{bmatrix}$  is singular.
18. Find the value of  $x$  such that the points  $(0, 2)$ ,  $(1, x)$  and  $(3, 1)$  are collinear.
19. Area of a triangle with vertices  $(k, 0)$ ,  $(1, 1)$  and  $(0, 3)$  is 5 unit. Find the value (s) of  $k$ .
20. If  $A$  is a square matrix of order 3 and  $|A| = -2$ , find the value of  $|-3A|$ .
21. If  $A = 2B$  where  $A$  and  $B$  are square matrices of order  $3 \times 3$  and  $|B| = 5$ , what is  $|A|$ ?
22. What is the number of all possible matrices of order  $2 \times 3$  with each entry 0, 1 or 2.
23. Find the area of the triangle with vertices  $(0, 0)$ ,  $(6, 0)$  and  $(4, 3)$ .
24. If  $\begin{vmatrix} 2x & 4 \\ -1 & x \end{vmatrix} = \begin{vmatrix} 6 & -3 \\ 2 & 1 \end{vmatrix}$ , find  $x$ .

25. If  $A = \begin{bmatrix} x+y & y+z & z+x \\ z & x & y \\ 1 & 1 & 1 \end{bmatrix}$ , write the value of  $\det A$ .
26. If  $A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}$  such that  $|A| = -15$ , find  $a_{11} C_{21} + a_{12} C_{22}$  where  $C_{ij}$  is cofactors of  $a_{ij}$  in  $A = [a_{ij}]$ .
27. If  $A$  is a non-singular matrix of order 3 and  $|A| = -3$  find  $|\text{adj } A|$ .
28. If  $A = \begin{bmatrix} 5 & -3 \\ 6 & 8 \end{bmatrix}$  find  $(\text{adj } A)$
29. Given a square matrix  $A$  of order  $3 \times 3$  such that  $|A| = 12$  find the value of  $|A \text{ adj } A|$ .
30. If  $A$  is a square matrix of order 3 such that  $|\text{adj } A| = 8$  find  $|A|$ .
31. Let  $A$  be a non-singular square matrix of order  $3 \times 3$  find  $|\text{adj } A|$  if  $|A| = 10$ .
32. If  $A = \begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}$  find  $|(A^{-1})^{-1}|$ .
33. If  $A = \begin{bmatrix} -1 & 2 & 3 \end{bmatrix}$  and  $B = \begin{bmatrix} 3 \\ -4 \\ 0 \end{bmatrix}$  find  $|AB|$ .

### SHORT ANSWER TYPE QUESTIONS (4 MARKS)

34. Find  $x, y, z$  and  $w$  if  $\begin{bmatrix} x-y & 2x+z \\ 2x-y & 3x+w \end{bmatrix} = \begin{bmatrix} -1 & 5 \\ 0 & 13 \end{bmatrix}$ .
35. Construct a  $3 \times 3$  matrix  $A = [a_{ij}]$  whose elements are given by
- $$a_{ij} = \begin{cases} 1+i+j & \text{if } i \geq j \\ \frac{|i-2j|}{2} & \text{if } i < j \end{cases}$$

36. Find  $A$  and  $B$  if  $2A + 3B = \begin{bmatrix} 1 & -2 & 3 \\ 2 & 0 & -1 \end{bmatrix}$  and  $A - 2B = \begin{bmatrix} 3 & 0 & 1 \\ -1 & 6 & 2 \end{bmatrix}$ .

37. If  $A = \begin{bmatrix} -1 \\ 2 \\ 3 \end{bmatrix}$  and  $B = \begin{bmatrix} -2 & -1 & -4 \end{bmatrix}$ , verify that  $(AB)' = B'A'$ .

38. Express the matrix  $\begin{bmatrix} 3 & 3 & -1 \\ -2 & -2 & 1 \\ -4 & -5 & 2 \end{bmatrix} = P + Q$  where  $P$  is a symmetric and  $Q$  is a skew-symmetric matrix.

39. If  $A = \begin{bmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{bmatrix}$ , then prove that  $A^n = \begin{bmatrix} \cos n\theta & \sin n\theta \\ -\sin n\theta & \cos n\theta \end{bmatrix}$  where  $n$  is a natural number.

40. Let  $A = \begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}$ ,  $B = \begin{bmatrix} 5 & 2 \\ 7 & 4 \end{bmatrix}$ ,  $C = \begin{bmatrix} 2 & 5 \\ 3 & 8 \end{bmatrix}$ , find a matrix  $D$  such that  $CD - AB = O$ .

41. Find the value of  $x$  such that  $\begin{bmatrix} 1 & x & 1 \end{bmatrix} \begin{bmatrix} 1 & 3 & 2 \\ 2 & 5 & 1 \\ 15 & 3 & 2 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ x \end{bmatrix} = 0$

42. Prove that the product of the matrices

$$\begin{bmatrix} \cos^2 \theta & \cos \theta \sin \theta \\ \cos \theta \sin \theta & \sin^2 \theta \end{bmatrix} \text{ and } \begin{bmatrix} \cos^2 \phi & \cos \phi \sin \phi \\ \cos \phi \sin \phi & \sin^2 \phi \end{bmatrix}$$

is the null matrix, when  $\theta$  and  $\phi$  differ by an odd multiple of  $\frac{\pi}{2}$ .

43. If  $A = \begin{bmatrix} 5 & 3 \\ 12 & 7 \end{bmatrix}$  show that  $A^2 - 12A - I = 0$ . Hence find  $A^{-1}$ .

44. If  $A = \begin{bmatrix} 2 & 3 \\ 4 & 7 \end{bmatrix}$  find  $f(A)$  where  $f(x) = x^2 - 5x - 2$ .

45. If  $A = \begin{bmatrix} 4 & 3 \\ 2 & 5 \end{bmatrix}$ , find  $x$  and  $y$  such that  $A^2 - xA + yI = 0$ .

46. Find the matrix  $X$  so that  $X \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} = \begin{bmatrix} -7 & -8 & -9 \\ 2 & 4 & 6 \end{bmatrix}$ .

47. If  $A = \begin{bmatrix} 2 & 3 \\ 1 & -4 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & -2 \\ -1 & 3 \end{bmatrix}$  then show that  $(AB)^{-1} = B^{-1}A^{-1}$ .

48. Test the consistency of the following system of equations by matrix method :

$$3x - y = 5; 6x - 2y = 3$$

49. Using elementary row transformations, find the inverse of the matrix

$$A = \begin{bmatrix} 6 & -3 \\ -2 & 1 \end{bmatrix}, \text{ if possible.}$$

50. By using elementary column transformation, find the inverse of  $A = \begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix}$ .

51. If  $A = \begin{bmatrix} \cos \alpha & -\sin \alpha \\ \sin \alpha & \cos \alpha \end{bmatrix}$  and  $A + A' = I$ , then find the general value of  $\alpha$ .

Using properties of determinants, prove the following : Q 52 to Q 59.

52. 
$$\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$$

53. 
$$\begin{vmatrix} x+2 & x+3 & x+2a \\ x+3 & x+4 & x+2b \\ x+4 & x+5 & x+2c \end{vmatrix} = 0 \text{ if } a, b, c \text{ are in A.P.}$$

54. 
$$\begin{vmatrix} \sin \alpha & \cos \alpha & \sin(\alpha + \delta) \\ \sin \beta & \cos \beta & \sin(\beta + \delta) \\ \sin \gamma & \cos \gamma & \sin(\gamma + \delta) \end{vmatrix} = 0$$

$$55. \begin{vmatrix} b^2 + c^2 & a^2 & a^2 \\ b^2 & c^2 + a^2 & b^2 \\ c^2 & c^2 & a^2 + b^2 \end{vmatrix} = 4a^2b^2c^2.$$

$$56. \begin{vmatrix} b+c & c+a & a+b \\ q+r & r+p & p+q \\ y+z & z+x & x+y \end{vmatrix} = 2 \begin{vmatrix} a & b & c \\ p & q & r \\ x & y & z \end{vmatrix}.$$

$$57. \begin{vmatrix} a^2 & bc & ac + c^2 \\ a^2 + ab & b^2 & ac \\ ab & b^2 + bc & c^2 \end{vmatrix} = 4a^2b^2c^2.$$

$$58. \begin{vmatrix} x+a & b & c \\ a & x+b & c \\ a & b & x+c \end{vmatrix} = x^2(x+a+b+c).$$

59. Show that :

$$\begin{vmatrix} x & y & z \\ x^2 & y^2 & z^2 \\ yz & zx & xy \end{vmatrix} = (y-z)(z-x)(x-y)(yz+zx+xy).$$

60. (i) If the points  $(a, b)$ ,  $(a', b')$  and  $(a-a', b-b')$  are collinear. Show that  $ab' = a'b$ .

(ii) If  $A = \begin{bmatrix} 2 & 5 \\ 2 & 1 \end{bmatrix}$  and  $B = \begin{bmatrix} 4 & -3 \\ 2 & 5 \end{bmatrix}$  verify that  $|AB| = |A||B|$ .

61. Given  $A = \begin{bmatrix} 0 & -1 & 2 \\ 2 & -2 & 0 \end{bmatrix}$  and  $B = \begin{bmatrix} 0 & 1 \\ 1 & 0 \\ 1 & 1 \end{bmatrix}$ . Find the product  $AB$  and

also find  $(AB)^{-1}$ .

62. Solve the following equation for  $x$ .

$$\begin{vmatrix} a+x & a-x & a-x \\ a-x & a+x & a-x \\ a-x & a-x & a+x \end{vmatrix} = 0.$$

63. If  $A = \begin{bmatrix} 0 & -\tan \frac{\alpha}{2} \\ \tan \frac{\alpha}{2} & 0 \end{bmatrix}$  and  $I$  is the identity matrix of order 2, show that,

$$I + A = (I - A) \begin{bmatrix} \cos \alpha & -\sin \alpha \\ \sin \alpha & \cos \alpha \end{bmatrix}$$

64. Use matrix method to solve the following system of equations :  $5x - 7y = 2$ ,  $7x - 5y = 3$ .

### LONG ANSWER TYPE QUESTIONS (6 MARKS)

65. Obtain the inverse of the following matrix using elementary row operations

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

66. Use product  $\begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix} \begin{bmatrix} -2 & 0 & 1 \\ 9 & 2 & -3 \\ 6 & 1 & -2 \end{bmatrix}$  to solve the system of equations

$$x - y + 2z = 1, 2y - 3z = 1, 3x - 2y + 4z = 2.$$

67. Solve the following system of equations by matrix method, where  $x \neq 0$ ,  $y \neq 0$ ,  $z \neq 0$

$$\frac{2}{x} - \frac{3}{y} + \frac{3}{z} = 10, \frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 10, \frac{3}{x} - \frac{1}{y} + \frac{2}{z} = 13.$$

68. Find  $A^{-1}$ , where  $A = \begin{bmatrix} 1 & 2 & -3 \\ 2 & 3 & 2 \\ 3 & -3 & -4 \end{bmatrix}$ , hence solve the system of linear equations :

$$x + 2y - 3z = -4$$

$$2x + 3y + 2z = 2$$

$$3x - 3y - 4z = 11$$

69. The sum of three numbers is 2. If we subtract the second number from twice the first number, we get 3. By adding double the second number and the third number we get 0. Represent it algebraically and find the numbers using matrix method.
70. Compute the inverse of the matrix.

$$A = \begin{bmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 5 \end{bmatrix} \text{ and verify that } A^{-1} A = I_3.$$

71. If the matrix  $A = \begin{bmatrix} 1 & 1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}$  and  $B^{-1} = \begin{bmatrix} 1 & 2 & 0 \\ 0 & 3 & -1 \\ 1 & 0 & 2 \end{bmatrix}$ , then compute  $(AB)^{-1}$ .

72. Using matrix method, solve the following system of linear equations :

$$2x - y = 4, 2y + z = 5, z + 2x = 7.$$

73. Find  $A^{-1}$  if  $A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$ . Also show that  $A^{-1} = \frac{A^2 - 3I}{2}$ .

74. Find the inverse of the matrix  $A = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$  by using elementary column transformations.

75. Let  $A = \begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}$  and  $f(x) = x^2 - 4x + 7$ . Show that  $f(A) = 0$ . Use this result to find  $A^5$ .

76. If  $A = \begin{bmatrix} \cos \alpha & -\sin \alpha & 0 \\ \sin \alpha & \cos \alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}$ , verify that  $A \cdot (\text{adj } A) = (\text{adj } A) \cdot A = |A| I_3$ .



77. For the matrix  $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ , verify that  $A^3 - 6A^2 + 9A - 4I = 0$ , hence find  $A^{-1}$ .

78. Find the matrix  $X$  for which

$$\begin{bmatrix} 3 & 2 \\ 7 & 5 \end{bmatrix} \cdot X \cdot \begin{bmatrix} -1 & 1 \\ -2 & 1 \end{bmatrix} = \begin{bmatrix} 2 & -1 \\ 0 & 4 \end{bmatrix}$$

79. By using properties of determinants prove the following :

$$\begin{vmatrix} 1+a^2-b^2 & 2ab & -2b \\ 2ab & 1-a^2+b^2 & 2a \\ 2b & -2a & 1-a^2-b^2 \end{vmatrix} = (1+a^2+b^2)^3.$$

$$80. \begin{vmatrix} (y+z)^2 & xy & zx \\ xy & (x+z)^2 & yz \\ xz & yz & (x+y)^2 \end{vmatrix} = 2xyz(x+y+z)^3.$$

$$81. \begin{vmatrix} a & a+b & a+b+c \\ 2a & 3a+2b & 4a+3b+2c \\ 3a & 6a+3b & 10a+6b+3c \end{vmatrix} = a^3.$$

$$82. \text{ If } x, y, z \text{ are different and } \begin{vmatrix} x & x^2 & 1+x^3 \\ y & y^2 & 1+y^3 \\ z & z^2 & 1+z^3 \end{vmatrix} = 0. \text{ Show that } xyz = -1.$$

83. If  $x, y, z$  are the 10<sup>th</sup>, 13<sup>th</sup> and 15<sup>th</sup> terms of a G.P. find the value of

$$\Delta = \begin{vmatrix} \log x & 10 & 1 \\ \log y & 13 & 1 \\ \log z & 15 & 1 \end{vmatrix}.$$

84. Using the properties of determinants, show that :

$$\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc \left( 1 + \frac{1}{a} + \frac{1}{b} + \frac{1}{c} \right) = abc + bc + ca + ab$$

85. Using properties of determinants prove that

$$\begin{vmatrix} -bc & b^2 + bc & c^2 + bc \\ a^2 + ac & -ac & c^2 + ac \\ a^2 + ab & b^2 + ab & -ab \end{vmatrix} = (ab + bc + ca)^3$$

86. If  $A = \begin{bmatrix} 3 & 2 & 1 \\ 4 & -1 & 2 \\ 7 & 3 & -3 \end{bmatrix}$ , find  $A^{-1}$  and hence solve the system of equations

$$3x + 4y + 7z = 14, 2x - y + 3z = 4, x + 2y - 3z = 0.$$

## ANSWERS

1.  $x = 2, y = 7$

2.  $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$

3. 11.

4. 4

5.  $\begin{bmatrix} 9 & -6 \\ 0 & 29 \end{bmatrix}$ .

6.  $\begin{bmatrix} 3 & -5 \\ -3 & -1 \end{bmatrix}$ .

7.  $AB = [26]$ .

8.  $x = 5$

9.  $x = -5$

10.  $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ .

11.  $a^2 + b^2 + c^2 + d^2$ .

12.  $x = -13$

13.  $k = \frac{3}{2}$

14.  $|A| = 1$ .

15. 46

16. -4

17.  $P = -8$

18.  $x = \frac{5}{3}$ .

19.  $k = \frac{10}{3}$ .

20. 54.

21. 40.

22. 729

23. 9 sq. units

24.  $x = \pm 2$

25. 0

26. 0

27. 9

28.  $\begin{bmatrix} 8 & 3 \\ -6 & 5 \end{bmatrix}$ .

29. 1728

30.  $|A| = 9$

31. 100

32. 11

33.  $|AB| = -11$

34.  $x = 1, y = 2, z = 3, w = 4$

35.  $\begin{bmatrix} 3 & 3/2 & 5/2 \\ 4 & 5 & 2 \\ 5 & 6 & 7 \end{bmatrix}$ .

36.  $A = \begin{bmatrix} \frac{11}{7} & -\frac{9}{7} & \frac{9}{7} \\ \frac{1}{7} & \frac{18}{7} & \frac{4}{7} \\ \frac{1}{7} & \frac{18}{7} & \frac{4}{7} \end{bmatrix}, B = \begin{bmatrix} -\frac{5}{7} & -\frac{2}{7} & \frac{1}{7} \\ \frac{4}{7} & -\frac{12}{7} & -\frac{5}{7} \\ \frac{4}{7} & -\frac{12}{7} & -\frac{5}{7} \end{bmatrix}$

40.  $D = \begin{bmatrix} -191 & -110 \\ 77 & 44 \end{bmatrix}$ .

41.  $x = -2$  or  $-14$

43.  $A^{-1} = \begin{bmatrix} -7 & 3 \\ 12 & -5 \end{bmatrix}$ .

44.  $f(A) = 0$

45.  $x = 9, y = 14$

46.  $x = \begin{bmatrix} 1 & -2 \\ 2 & 0 \end{bmatrix}$ .

48. Inconsistent

49. Inverse does not exist.

$$50. \quad A^{-1} = \begin{bmatrix} 2 & -1 \\ -5 & 3 \end{bmatrix}.$$

$$51. \quad \alpha = 2n\pi \pm \frac{\pi}{3}, \quad n \in \mathbb{Z}$$

$$61. \quad AB = \begin{bmatrix} 1 & 2 \\ -2 & 2 \end{bmatrix}, \quad (AB)^{-1} = \frac{1}{6} \begin{bmatrix} 2 & -2 \\ 2 & -1 \end{bmatrix}.$$

$$62. \quad 0, 3a$$

$$64. \quad x = \frac{11}{24}, \quad y = \frac{1}{24}.$$

$$65. \quad A^{-1} = \begin{bmatrix} \frac{1}{2} & -\frac{1}{2} & \frac{1}{2} \\ -4 & 3 & -1 \\ \frac{5}{2} & -\frac{3}{2} & \frac{1}{2} \end{bmatrix}.$$

$$66. \quad x = 0, \quad y = 5, \quad z = 3$$

$$67. \quad x = \frac{1}{2}, \quad y = \frac{1}{3}, \quad z = \frac{1}{5}$$

$$68. \quad A^{-1} = -\frac{1}{67} \begin{bmatrix} -6 & 17 & 13 \\ 14 & 5 & -8 \\ -15 & 9 & -1 \end{bmatrix}$$

$$69. \quad x = 1, \quad y = -2, \quad z = 2$$

$$70. \quad A^{-1} = \begin{bmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$$

$$71. \quad (AB)^{-1} = \frac{1}{19} \begin{bmatrix} 16 & 12 & 1 \\ 21 & 11 & -7 \\ 10 & -2 & 3 \end{bmatrix}.$$

$$72. \quad x = 3, \quad y = 2, \quad z = 1.$$

$$73. \quad A^{-1} = \frac{1}{2} \begin{bmatrix} -1 & 1 & 1 \\ 1 & -1 & 1 \\ 1 & 1 & -1 \end{bmatrix}.$$

$$74. \quad A^{-1} = \begin{bmatrix} 3 & 2 & 6 \\ 1 & 1 & 2 \\ 2 & 2 & 5 \end{bmatrix}$$

$$75. \quad A^5 = \begin{bmatrix} -118 & -93 \\ 31 & -118 \end{bmatrix}.$$

$$77. \quad A^{-1} = \frac{1}{4} \begin{bmatrix} 3 & 1 & -1 \\ 1 & 3 & 1 \\ -1 & 1 & 3 \end{bmatrix}.$$

$$78. \quad X = \begin{bmatrix} -16 & 3 \\ 24 & -5 \end{bmatrix}.$$

$$83. \quad 0$$

$$86. \quad x = 1, y = 1, z = 1.$$

## **CLASS- XII HOLIDAYS HOME WORK**

### **ENGLISH**

1. Read newspaper daily and cut samples of the following & paste them in the fair notebook of English underlining it with the holidays homework a) 3 reports  
b) 3 articles  
c) 3 posters
2. Write a letter to the editor of a national daily highlighting the neglect of our national monuments and how these are being damaged in the present day world.
3. Write an article on the topic 'how Google controls the life of an average person' (150-200 words)
4. Learn and revise all the syllabus of periodic test -1
5. Suggested topics for project
  1. Investigation on the result of students' reading habits on their academic performance in external examinations. (CBSE)
  2. Linguistic Chauvinism in India
  3. War and its ramifications
  4. Gandhism: Obsolete or Relevant
  5. Life on children in slum area
  6. Child labour in my cityAny other topic with teacher's discussion.

#### **THE PROJECT – PORTFOLIO MUST INCLUDE THE FOLLOWING:**

- I. Cover Page – Title of Project
  - II. School details & detail of students
  - III. Statement of Purpose / objectives / goals.
  - IV. Acknowledgement
  - V. Certificate of completion under the guidance of the teacher.
  - VI. Action Plan for the Project
  - VII. Questionnaires for interview
  - VIII. A 'Report' on the Topic opted for.
  - IX. List of resources / bibliography
2. INCLUSIONS: Photographs that capture the positive learning experience of the student

### **BIOLOGY**

1. Prepare any one model
  - to show microspore-genesis in T S of anther
  - structure and germination of pollen grain
  - structure of anatropous ovule before fertilization
  - development of embryo sac
2. Prepare mind map for development of dicot embryo  
Or  
Hormonal control of male and female reproductive system  
Or  
Assisted reproductive techniques (ART)
3. Prepare a chart showing monohybrid or di-hybrid cross conducted by Mendel.
4. Maintain practical file and notebook of biology.
5. Solve the attached assignment in note book.

## ASSIGNMENT -1, LESSON-REPRODUCTION IN PLANTS

1. Name the component cells of the 'egg apparatus' in an embryo sac.
2. Name the part of gynoecium that determines the compatible nature of pollen grain.
3. Name the common function that cotyledons and nucellus perform.

In the diagram given below, show the path of a pollen tube from the pollen on the stigma into the embryo sac.  
Name the components of egg apparatus.



4. Name the parts of pistil which develop into fruit and seeds.
5. In case of polyembryony, if an embryo develops from the synergid and another from the nucellus which is haploid and which is diploid?
6. Can an unfertilised, apomictic embryo sac give rise to a diploid embryo? If yes, then how?
7. Which are the three cells found in a pollen grain when it is shed at the three celled stage?
8. What is self-incompatibility?
9. Name the type of pollination in self-incompatible plants.
10. Draw the diagram of a mature embryo sac and show its 8-nucleate, 7-celled nature. Show the following parts: antipodals, synergids, egg, central cell, polar nuclei.
11. Which is the triploid tissue in a fertilised ovule? How is the triploid condition achieved?
12. Are pollination and fertilisation necessary in apomixis? Give reasons.
13. Identify the type of carpel with the help of diagrams given below:  
How is pollination carried out in water plants?
14. What is the function of the two male gametes produced by each pollen grain in angiosperms.

### Short Answer Type Questions

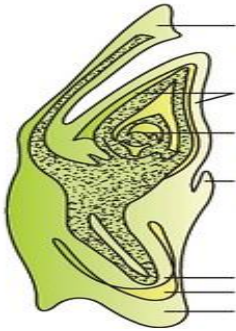
1. List three strategies that a bisexual chasmogamous flower can evolve to prevent self pollination (autogamy).
2. Given below are the events that are observed in an artificial hybridization programme. Arrange them in the correct sequential order in which they are followed in the hybridisation programme.
  - (a) Re-bagging
  - (b) Selection of parents
  - (c) Bagging
  - (d) Dusting the pollen on stigma
  - (e) Emasculation

- (f) Collection of pollen from male parent.

3. Vivipary automatically limits the number of offsprings in a litter. How?

4. Does self incompatibility impose any restrictions on autogamy? Reasons and suggest the method of pollination in such plants.

5. In the given diagram, write the names of parts shown with lines.



6. What is polyembryony and how can it be commercially exploited?

7. Are parthenocarpy and apomixis different phenomena? Discuss their benefits.

Hint: Yes, they are different. Parthenocarpy leads to development of seedless fruits. Apomixis leads to embryo development.

8. Why does the zygote begin to divide only after the division of Primary endosperm cell (PEC)?

9. The generative cell of a two-celled pollen divides in the pollen tube but not in a three-celled pollen. Give reasons.

10. In the figure given below label the following parts: male gametes, egg cell, polar nuclei, synergid and pollen tube



### Long Answer Type Questions

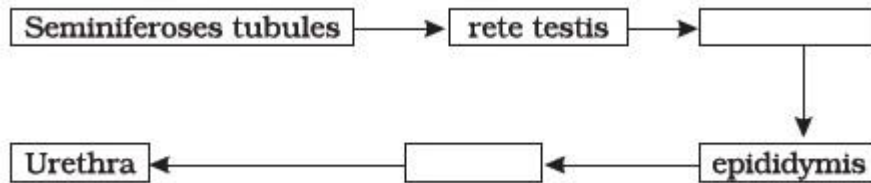
1. Starting with the zygote, draw the diagrams of the different stages of embryo development in a dicot.
2. What are the possible types of pollinations in chasmogamous flowers. Give reasons.
3. With a neat, labelled diagram, describe the parts of a mature angiosperm embryo sac. Mention the role of synergids.
4. Draw the diagram of a microsporangium and label its wall layers. Write briefly on the role of the endothecium.
5. Embryo sacs of some apomictic species appear normal but contain diploid cells. Suggest a suitable explanation for the condition.



## ASSIGNMENT -1, LESSON-REPRODUCTION IN HUMAN BEINGS

1. Given below are the events in human reproduction. Write them in correct sequential order. Insemination, gametogenesis, fertilisation, parturition, gestation, implantation

2. The path of sperm transport is given below. Provide the missing steps in blank boxes.



3. What is the role of cervix in the human female reproductive system?

4. Why are menstrual cycles absent during pregnancy.

5. Female reproductive organs and associated functions are given below in column A and B. Fill the blank boxes.

### Column A

### Column B

Ovaries

Ovulation

Oviduct

a

b

Pregnancy

Vagina

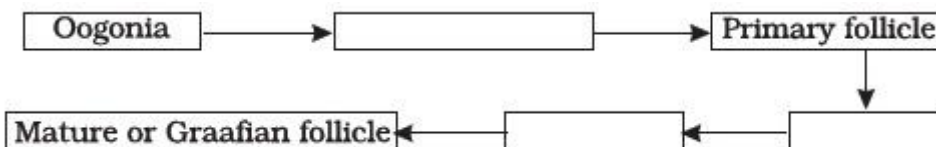
Birth

6. From where the parturition signals arise-mother or foetus? Mention the main hormone involved in parturition.

7. What is the significance of epididymis in male fertility?

8. Give the names and functions of the hormones involved in the process of spermatogenesis. Write the names of the endocrine glands from where they are released.

9. The mother germ cells are transformed into a mature follicle through series of steps. Provide the missing steps in the blank boxes.



10. During reproduction, the chromosome number (2n) reduces to half (n) in the gametes and again the original number (2n) is restored in the offspring, What are the processes through which these events take place?

11. What is the difference between a primary oöcyte and a secondary oöcyte?

12. What is the significance of ampullary–isthmic junction in the female reproductive tract?

13. How does zonapellucida of ovum help in preventing polyspermy?

14. Mention the importance of LH surge during menstrual cycle.

15. Which type of cell division forms spermatids from the secondary spermatocytes?

Short Answer Type Questions

1. A human female experiences two major changes, menarche and menopause during her life. Mention the significance of both the events.
2. a. How many spermatozoa are formed from one secondary spermatocyte?  
b. Where does the first cleavage division of zygote take place?
3. Corpus luteum in pregnancy has a long life. However, if fertilisation does not take place, it remains active only for 10-12 days. Explain.
4. What is foetal ejection reflex? Explain how it leads to parturition?
5. Except endocrine function, what are the other functions of placenta.
6. Why doctors recommend breast feeding during initial period of infant growth?
7. What are the events that take place in the ovary and uterus during follicular phase of the menstrual cycle.
8. Give a schematic labelled diagram to represent oögenesis (without descriptions)
9. What are the changes in the oogonia during the transition of a primary follicle to Graafian follicle?

#### Long Answer Type Questions

1. What role does pituitary gonadotropins play during follicular and ovulatory phases of menstrual cycle? Explain the shifts in steroidal secretions.
2. Meiotic division during oogenesis is different from that in spermatogenesis. Explain how and why?
3. The zygote passes through several developmental stages till implantation, Describe each stage briefly with suitable diagrams.
4. Draw a neat diagram of the female reproductive system and label the parts associated with the following (a) production of gamete, (b) site of fertilisation (c) site of implantation and, (d) birth canal.
5. With a suitable diagram, describe the organisation of mammary gland.

### CHEMISTRY

- Prepare working model of Electrochemical Cell.
- Prepare working model of Electrolytic/Dry Cell
- Prepare Chart of Positive/Negative Deviation.
- Prepare 3D Model of Osmotic Pressure/Reverse Osmosis.
- Make a chart or 3D Model of conductivity of Cell.
- Chart of graph showing variation of Molar Conductivity with concentration for strong and weak electrolyte.
- Prepare chart or 3D Model of Standard Hydrogen Potential.
- Complete Practical File.
- Solve the assignment in your notebook

#### Chapter-2 (Solutions) ASSIGNMENT-2

One Mark

1. Define the term solution. How many types of solutions are formed?
2. Define mole fraction.
3. How does the Molarity of a solution change with temperature?

4. Define Solubility.
5. State Henry law.
6. Write any one application based on Henry's law.
7. Define Anoxia.
8. What is the importance of Henry, s law constant?
9. Enumerate factors affecting solubility of a solute in a given solvent.
10. Comment on the following statement: "The importance of solutions in life is determined by Its concentration"

Two Mark

11. Calculate the mole fraction of ethylene glycol ( $C_2H_5O_2$ ) in a solution containing 20% of  $C_2H_6O_2$  by mass.
12. Calculate the molarity of a solution containing 5g of NaOH in 450mL solution.
13. Calculate molality of 2.5g ethanoic acid in 75g benzene.
14. Calculate the mass percentage of Benzene in solution containing 30% by mass in carbon tetrachloride.
15. If  $N_2$  gas is bubbled through water at 293K, how many mill moles of  $N_2$  gas would dissolve in one litre of water? Assume that  $N_2$  exerts a partial pressure of 0.987bar. Given that Henry's law constant for  $N_2$  at 293K is 76.48kbar.
16. What role does the molecular interaction play in a solution of alcohol and water?
17. State Raoult,s law for the solution containing volatile components. What is the similarity Between Raoult, s law and Henry's law.
18. Write two differences between a solution showing positive deviation and a solution showing Negative deviation from Raoult's law.
19. Differences between Ideal and non-Ideal solution.
20. (i) Why is an increase in temperature observed on mixing chloroform and acetone.  
(ii) Why does sodium chloride solution freeze at a lower temperature than water?

## PHYSICS

### 1. Prepare a 3 D creative model on any of the following topic;

Methods of charging

Wheat stone bridge , Combination of Capacitors / Resistors / Cells

Any other topic of your choice of chapter 1 or 2

### 2. Prepare A 3 size sheet on any of the following topic

Electric field lines due to system of single charge, two charges equal and similar, equal and dissimilar charge, unequal and similar

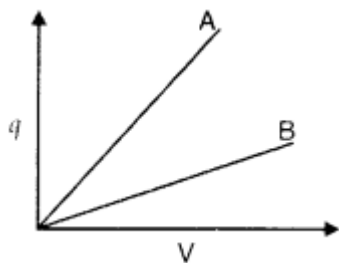
Equipotential surfaces due to system of single charge, two charges equal and similar, equal and dissimilar charge, unequal and similar

### 3. Complete N.C.E.R.T. back exercise of chapter1 &2 and practice numerical and conceptals.

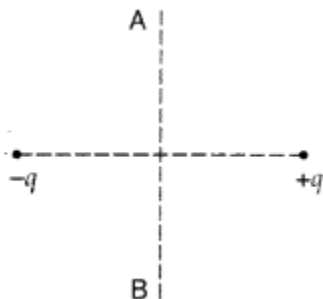
### 4. Complete Experiment no 1 and 2 in your practical files .

### 5. Solve the following assignment in your notebook

- Two charges  $2\mu\text{C}$  and  $-2\mu\text{C}$  are placed at points A and B 5 cm apart. Depict an equipotential surface of the system
- The given graph shows variation of charge 'q' versus potential difference 'V' for two capacitors  $C_1$  and  $C_2$ . Both the capacitors have same plate separation but plate area of  $C_2$  is greater than that of  $C_1$ . Which line (A or B) corresponds to  $C_1$  and why? (Comptt. All India 2014)

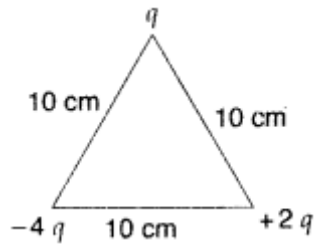


- A charge 'q' is moved from a point A above a dipole of dipole moment 'p' to a point B below the dipole in equatorial plane without acceleration. Find the work done in the process. (All India 2016)



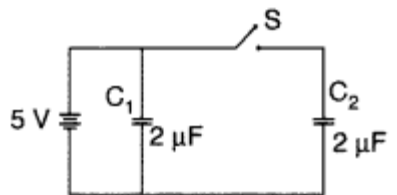
- Two point charges  $4Q$ ,  $Q$  are separated by  $1\text{m}$  in air. At what point on the line joining the charges is the electric field intensity zero?  
Also calculate the electrostatic potential energy of the system of charges, taking the value of charge,  $Q = 2 \times 10^{-7}\text{C}$

5. Calculate the work done to dissociate the system of three charges placed on the vertices of a triangle as shown. (Delhi 2008)

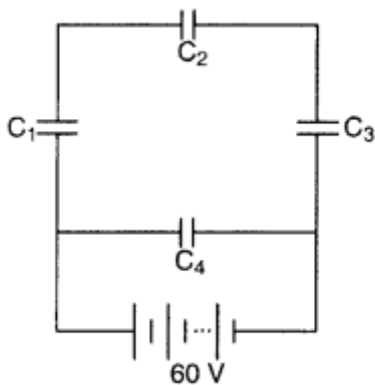


6. Draw 3 equipotential surfaces corresponding to a field that uniformly increases in magnitude but remains constant along Z-direction. How are these surfaces different from that of a constant electric field along Z-direction?
7. Draw a plot showing the variation of
- electric field (E) and
  - electric potential
  - with distance  $r$  due to a point charge  $Q$ . (Delhi 2012)

8. Figure shows two identical capacitors  $C_1$  and  $C_2$ , each of  $2\ \mu\text{F}$  capacitance, connected to a battery of  $5\ \text{V}$ . Initially switch 'S' is left open and dielectric slabs of dielectric constant  $K = 5$  are inserted to fill completely the space between the plates of the two capacitors. How will the charge and



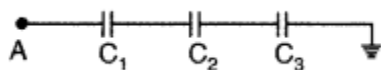
- (ii) potential difference between the plates of the capacitors be affected after the slabs are inserted? (Delhi 2011)
9. A network of four capacitors, each of capacitance  $30\ \text{pF}$ , is connected across a battery of  $60\ \text{V}$  as shown in the figure. Find the net capacitance and the energy stored in each capacitor. (Comptt. All India 2012)



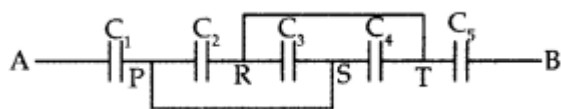
10. Two parallel plate X and Y capacitors, X and Y, have the same area of plates and same separation between them. X has air between the plates while Y contains a dielectric medium of  $\epsilon_r = 4$ .

- (i) Calculate capacitance of each capacitor if equivalent capacitance of the combination is  $4\ \mu\text{F}$ .
- (ii) Calculate the potential difference between the plates of X and Y.
- (iii) What is the ratio of electrostatic energy stored in X and Y?

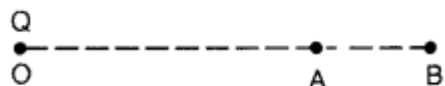
11. A parallel plate capacitor is charged by a battery. After some time the battery is disconnected and a dielectric slab of dielectric constant  $K$  is inserted between the plates. How would
- (i) the capacitance,
  - (ii) the electric field between the plates and
  - (iii) the energy stored in the capacitor, be affected? Justify your answer.
12. A slab of material of dielectric constant  $K$  has the same area as that of the plates of a parallel plate capacitor but has the thickness  $d/2$ , where  $d$  is the separation between the plates. Find out the expression for its capacitance when the slab is inserted between the plates of the capacitor.
13. Calculate the potential difference and the energy stored in the capacitor  $C_2$  in the circuit shown in the figure. Given potential at A is  $90\ \text{V}$ ,  $C_1 = 20\ \mu\text{F}$ ,  $C_2 = 30\ \mu\text{F}$  and  $C_3 = 15\ \mu\text{F}$ . (All India 2015)



14. (i) Find equivalent capacitance between A and B in the combination given below. Each capacitor is of  $2\ \mu\text{F}$  capacitance



- (ii) If a dc source of  $7\ \text{V}$  is connected across AB, how much charge is drawn from the source and what is the energy stored in the network? (Delhi 2015)
15. A point charge  $Q$  is placed at point O as shown in the figure. Is the potential difference  $V_A - V_B$  positive, negative or zero, if  $Q$  is
- (i) positive
  - (ii) negative? (Delhi 2011)



## I.P

1. Revise Series and DataFrame practical questions.
2. Assignment:

1. Fill in the blanks :

```
# Series Creation from List with custom indexing
import pandas as pd
l1=[11,12,13,14]
series1=pd.Series(l1, _____=["1st","2nd","3rd","4th"])
print(series1)
```

- a. row
  - b. index
  - c. row\_index
  - d. Any above option
2. While trying to create series from dictionary, keys of dictionary become index.
    - a. True
    - b. False
    - c. Depends on Python Version
    - d. Depends on Machine Configuration
  3. Predict data elements of series1 :

```
# Series Creation from Scalar Value with custom indexing
import pandas as pd
series1=pd.Series(5,index=["A","B","C","D"])
print(series1)
```

- a. 5,1,1,1
- b. 5,0,0,0
- c. 5,1,5,1
- d. 5,5,5,5

4. Which index, data elements will be printed by below code as output :

```
# Selection
import pandas as pd
l1=[11,12,13,14]
s1=pd.Series(l1)
print(s1.loc[2:])
```

- a. Data : 12,13,14 along with series-index 1,2,3
- b. Data : 13,14 along with series-index 'C','D'
- c. Data : 13,14 along with series-index 2,3
- d. Data : 12,13,14 along with series-index 'B','C','D'

```
s1=pd.Series(l1, index=['I', 'II', 'III', 'IV'])
print(s1._____['II':])
```

re, identify which attribute can be used to

```
II      12
III     13
IV      14
```

- a. loc
- b. iloc
- c. loc or iloc
- d. Neither loc nor loc

What will be the output of following code- import pandas as pd

```
s1=pd.Series([1, 2, 2, 7, 'Sachin', 77.5]) print(s1.head())
```

- a. Last data elements of series along with its indices i.e. -1.
- b. First data element of series along with its indices i.e. 0.
- c. Entire series
- d. First five data elements of series along with its indices i.e. 0,1,2,3,4 respectively

Series is 1-D labelled array having two parts i.e. Index, Data. We can create series from:

- a. Python Sequence , Dictionary
- b. All 4 ( ie Python Sequence , Dictionary , Scalar value , Numpy Array)
- c. Scalar value , Numpy Array
- d. None of stated option.

```
import pandas as pd
l1=[11,12,13,14,15]
s1=pd.Series(l1, index=['a', 'b', 'c', 'd', 'e'])
```

thon command can be used

- a. s1.iloc[1:3] or s1.loc[ 'b': 'd' ]



## PHYSICAL EDUCATION

1. Revise Chapter-1,2 and 3 and complete your notebook.
2. Do the following Practical in Practical File :
  - SAI Khelo India Test for School Children.
  - Perform any two asanas used to cure Obesity, Asthma, Hypertension, Diabetes and Back pain (2 for each). Paste your pictures on LHS and briefly explain the procedure, benefits and contraindications for them.
3. Evaluate yourself for the following tests and do practice daily:
  - Sit and Reach Test
  - Sit-Ups Test
  - Push-Ups for boys
  - Modified push-ups for girls
  - 50 mts. standing start
  - Partial curl ups
  - 600m run/walk
4. Do **any one** of the following activity:
  - Prepare a model comparing the knockout and league fixture for 11 teams.
  - Prepare a chart/model on postural deformities- Kyphosis, Lordosis and Scoliosis.
  - Prepare a chart/model on postural deformities-Flat foot, Knock-knee and Bow Legs.
  - Prepare a project file on IPL Teams 2023.





