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+2 MATHS
STUDY MATERIAL

MATHS VOLUME -I (1 ,2 , 5 , 6)

BOOK INSIDE ONE MARKS

SAIVEERA ACADEMY TEST SERIES

1.One Marks Test (Lesson wise , Half portion , Full portion) [EM]

2.Revision Test (4 tests) [EM]

3.Half Portion Test (2 tests) [EM]

4.Full Portion Test (10 tests) [EM]

5.Chapterwise (20 tests) [EM]

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Chapter 1 – Applications of Matrices and Determinants

1. The rank of the matrix $\begin{bmatrix} 1 & -1 & 2 \\ 2 & -2 & 4 \\ 4 & -4 & 8 \end{bmatrix}$ is

1) 1 2) 2 3) 3 4) 4

Ans : R_2 and R_1 are proportional Therefore rank is 1

2. The rank of the diagonal matrix $\begin{bmatrix} -1 & & & & \\ & 2 & & & \\ & & 0 & & \\ & & & -4 & \\ & & & & 0 \end{bmatrix}$

1) 0 2) 2 **3) 3** 4) 5

Ans : The matrix has only three non zero rows .Therefore Rank is 3

3. If $A = [2\ 0\ 1]$, then rank of AA^T is

1) 1 2) 2 3) 3 4) 0

Ans : Order of A and A^T is 1 × 3 and 3 × 1 .The order of AA^T is 1 × 1 .Rank is 1

4. If $A = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$, then the rank of AA^T is

1) 3 2) 0 **3) 1** 4) 2

Ans : $AA^T = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 3 & 6 & 9 \end{bmatrix}$ R_2 and R_3 are proportional to R_1. Therefore rank is 1

5. If the rank of the matrix $\begin{bmatrix} \lambda & -1 & 0 \\ 0 & \lambda & -1 \\ -1 & 0 & \lambda \end{bmatrix}$ is 2, then λ is

1) 1 2) 2 3) 3 4) any real number

Ans : Rank is 2 means determinant value is 0 . $\lambda^3 - 1 = 0$

6. If A is a scalar matrix with scalar $k \neq 0$,of order 3, then A^{-1} is

1) $\frac{1}{k^2} I$ 2) $\frac{1}{k^3} I$ **3) $\frac{1}{k} I$** 4) kI

Ans : adjA = k^{n-1} I . Here n = 3 . $|A| = k^3$. Therefore $A^{-1} = \frac{1}{k} I$

7. If the matrix $\begin{bmatrix} -1 & 3 & 2 \\ 1 & k & -3 \\ 1 & 4 & 5 \end{bmatrix}$ has an inverse then the values of k

1) k is any real number 2) $k = -4$ **3) $k \neq -4$** 4) $k \neq 4$

Ans : It has inverse means determinant ≠ 0 .i.e 7k – 28 ≠ 0

8. If A is a square matrix of order n then $|adj\ A|$ is

1) $|A|^2$ 2) $|A|^n$ **3) $|A|^{n-1}$** 4) $|A|$

Ans : A(adj A) = $|A|I$

Taking determinant on both sides

$|A|\ |adj\ A| = \ |A|^n\ |I|$

$|adj\ A| = |A|^{n-1}$

9. If A is a matrix of order 3, then $\det(kA)$

1) $k^3 \det(A)$ 2) $k^2 \det(A)$ 3) $k\ \det(A)$ 4) $\det(A)$

Ans :.Order of A is 3

10. If I is the unit matrix of order n, where $k \neq 0$ is a constant, then $adj(kI) =$

1) $k^n(adj\ I)$ 2) $k\ (adj\ I)$ 3) $k^2(adj\ I)$ **4) $k^{n-1}(adj\ I)$**

11. Which of the following statement is correct regarding homogeneous system

1) always inconsistent 2) has only trivial solution

3) has only non-trivial solutions

4) has only trivial solution only if rank of the coefficient matrix is equal to the number of unknowns

12. If $\rho(A) = r$ then which of the following is correct ?

1) all the minors of order r which does not vanish

2) has atleast one minor of order r which does not vanish

3) A has atleast one (r+1) order minor which vanishes

4) all (r+1) and higher order minors should not vanish

13. In echelon form, which of the following is incorrect?

1) Every row of A which has all its entries 0 occurs below every row which has a non-zero entry

2) The first non-zero entry in each non-zero row is 1

3) The number of zeroes before the first non-zero element in a row is less than the number of such zeroes in the next row

4) Two rows can have same number of zeroes before the first non-zero entry

14. Every homogeneous system

1) is always consistent 2) has only trivial solution

3) has infinitely many solutions 4) need not be consistent

15. In the system of 3 linear equations with three unknowns, in the non- homogeneous system $\rho(A) = \rho(A, B) = 2$ then the system

1) has unique solution

2) reduces to 2 equations and has infinitely many solution

3) reduces to a single equations and has infinitely many solution

4) is inconsistent

16. In the homogeneous system with three unknowns, $\rho(A)$ =number of unknowns then the system has

1) only trivial solution 2) reduces to 2 equations and has infinitely many solution

3) reduces to a single equations and has infinitely many solution 4) is inconsistent

Chapter – 2 Complex numbers

1. The value of $[\frac{-1+i\sqrt{3}}{2}]^{100} + [\frac{-1+i\sqrt{3}}{2}]^{100}$ is

1) 2 2) 0 **3) -1** 4) 1

Ans : $\omega^{100} + (\omega^2)^{100} = \omega + \omega^2 = -1$

2. If $(m-5) + i(n+4)$ is the complex conjugate of $(2m+3) + i(3n-2)$, then (n, m) are

1) $-\frac{1}{2}, -8$ 2) $-\frac{1}{2}, 8$ 3) $\frac{1}{2}, -8$ 4) $\frac{1}{2}, 8$

Ans : $(m-5) + i(n+4) = (2m+3) - i(3n-2),$

3. If $x^2 + y^2 = 1$ then the value of $\frac{1+x+iy}{1+x-iy}$ is

1) $x - iy$ 2) $2x$ 3) $-2iy$ **4)** $x + iy$

Ans : $x^2 + y^2 = 1$ $|z| = 1$ $\bar{z} = \frac{1}{z}$

$$\frac{1+x+iy}{1+x-iy} = \frac{1+z}{1+\bar{z}} = \frac{1+z}{1+\left(\frac{1}{z}\right)} = z$$

4. If $a = 3 + i$ and $z = 2 - 3i$ then the points on the Argand diagram representing $az, 3az$ and $-az$ are

1) Vertices of a right angled triangle (2) Vertices of an equilateral triangle

(3) Vertices of an isosceles triangle **(4) Collinear**

Ans : If one complex number is multiplied by a real number then its moves on a straight line

Here az is a complex number .It is multiplied by 3 and – 1

They are lying on a straight line i.e collinear

5. If *z* represents a complex number then arg (z) + arg ($\bar{z}$) is

1) $\frac{\pi}{4}$ 2) $\frac{\pi}{2}$ 3) 0 4) $\frac{\pi}{4}$

Ans : arg (z) =- arg ($\bar{z}$) arg (z) + arg ($\bar{z}$) = 0

6. If the amplitude of a complex number is $\frac{\pi}{2}$ then the number is

1) purely imaginary 2) purely real

3) 0 4) neither real nor imaginary

7. If the point represented by the complex number *iz* is rotated about the origin through the angle $\frac{\pi}{2}$ in the counter clockwise direction then the complex number representing the new position is

1) *iz* 2) – *iz* **3) − *z*** 4) *z*

Ans : Rotating about the origin through $\frac{\pi}{2}$ in the counter clockwise means multiplying the given number by I .Therefore new position is iz.i = -z

8. The polar form of the complex number $(i^{25})^3$ is

1) $\cos\frac{\pi}{2} + i\sin\frac{\pi}{2}$ 2) $\cos\pi + i\sin\pi$ 3) $\cos\pi - i\sin\pi$ **4) $\cos\frac{\pi}{2} - i\sin\frac{\pi}{2}$**

Ans : $i^{75} = i^3 = -i = \cos\frac{\pi}{2} - i\sin\frac{\pi}{2}$

9. If P represents the variable complex number z and if $|2z-1| = 2|z|$ then the locus of P is

1) the straight line $x = \frac{1}{4}$ 2) the straight line $y = \frac{1}{4}$

3) the straight line $z = \frac{1}{2}$ 4) the circle $x^2 + y^2 - 4x - 1 = 0$

Ans : $|2z-1| = 2|z|$ $\left|z - \frac{1}{2}\right| = |z - 0|$

10. If $z_n = \cos\frac{n\pi}{3} + i\sin\frac{n\pi}{3}$ then $z_1 z_2 \ldots z_6$ is

1) 1 **2) -1** 3) i 4) $-i$

Ans : $z_1 z_2 \ldots z_6 = cis\left(\frac{\pi}{3} + \frac{2\pi}{3} + \pi + \frac{4\pi}{3} + \frac{5\pi}{3} + 2\pi\right) = cis\,(7\pi) = -1$

11. If $-\bar{z}$ lies in the third quadrant then z lies in the

1) first quadrant 2) second quadrant 3) third quadrant **4) fourth quadrant**

Ans : $-\bar{z}$ lies in the third quadrant then $\bar{z}$ lies in the I[st] quadrant

Z lies in 4[th] quadrant

12. If ω is a cube root of unity then the value of $(1-\omega+\omega^2)^4 + (1+\omega-\omega^2)^4$ *is*

1) 0 2) 32 **3) -16** 4) -32

Ans : $1 + \omega + \omega^2 = 0$

13. If ω is the nth root of unity then

1) $1 + \omega^2 + \omega^4 + \cdots = \omega + \omega^3 + \omega^5 + \cdots$ 2) $\omega^n = 0$

3) $\omega^n = 1$ 4) $\omega = \omega^{n-1}$

14. If ω is the cube root of unity then the value of $(1-\omega)(1-\omega^2)(1-\omega^4)(1-\omega^8)$ is

1) 9 2) – 9 3) 16 4) 32

Ans : $1 + \omega + \omega^2 = 0$

15. The cube roots of unity are

1) in G.P with common ratio ω 2) in G.P with common difference ω^2

3) in A.P with common difference ω 4) in A.P with common difference ω^2

16. The arguments of nth roots of a complex number differ by

1) $\frac{2\pi}{n}$ 2) $\frac{\pi}{n}$ 3) $\frac{3\pi}{n}$ 4) $\frac{4\pi}{n}$

17. Which of the following statements is correct?

1) negative complex numbers exists 2) order relation does not exist in real number

3) order relation exists in complex numbers **4) $(1+i) > (3-2i)$ is meaningless**

18. Which of the following are correct?

i) $Re(Z) \le |Z|$ ii) $Im(Z) \ge |Z|$ iii) $|\bar{Z}| = |Z|$ iv) $(\overline{Z^n}) = (\bar{Z})^n$

1) (i),(ii) 2) (ii),(iii) 3) (ii),(iii) and (iv) **4) (i),(iii) and (iv)**

19. The value of $\bar{\bar{Z}} + \bar{Z}$ is

1) $2\,Re(Z)$ 2) $Re(Z)$ 3) $Im(Z)$ 4) $2\,Im(Z)$

20. The value of $Z - \bar{Z}$ is

1) $2\,Im(Z)$ **2) $2i\,Im(Z)$** 3) $Im(Z)$ 4) $i\,Im(Z)$

21. The value of $Z\bar{Z}$ is

1) $|Z|$ **2) $|Z|^2$** 3) $2|Z|$ 4) $2\,|Z|^2$

22. If $|Z - Z_1| = |Z - Z_2|$ then the locus of Z is

1) a circle with centre at the origin 2) a circle with centre at Z_1

3) a straight line passing through the origin

4) is a perpendicular bisector of the line joining Z_1 and Z_2

23. The principal value of argZ lies in the interval

1) $\left[0, \frac{\pi}{2}\right]$ **2) $(-\pi, \pi]$** 3) $[0, \pi]$ 4) $(-\pi, 0]$

24. If Z_1 and Z_2 are any two complex numbers then which one of the following is false

1) $Re(Z_1 + Z_2) = Re(Z_1) + Re(Z_2)$ 2) $Im(Z_1 + Z_2) = Im(Z_1) + Im(Z_2)$

3) $arg(Z_1 + Z_2) = arg(Z_1) + arg(Z_2)$ 4) $|Z_1 Z_2| = |Z_1| + |Z_2|$

25. The fourth roots of unity are

1) $1 \pm i, -1 \pm i$ 2) $\pm i, 1 \pm i$ **3) $\pm 1, \pm i$** 4) $1, -1$

26. The fourth roots of unity form the vertices of

1) an equilateral triangle **2) a square** 3) a hexagon 4) a rectangle

27. Cube roots of unity are

1) $1, \frac{-1 \pm i\sqrt{3}}{2}$ 2) $i, -1 \pm \frac{i\sqrt{3}}{2}$ 3) $1, \frac{1 \pm i\sqrt{3}}{2}$ 4) $i, \frac{1 \pm i\sqrt{3}}{2}$

28. Geometrical interpretation of $\bar{Z}$ is

1) reflection of Z on real axis 2) reflection of Z on imaginary axis

3) rotation of Z about origin 4) rotation of Z about origin through $\frac{\pi}{2}$ in clockwise direction

29. Identify the correct statement

1) Sum of the moduli of two complex numbers is equal to their modulus of the sum

2) Modulus of the product of the complex numbers is equal to sum of the moduli

3) Arguments of the product of two complex numbers is the product of their arguments

4) Arguments of the product of two complex numbers is equal to the sum of their arguments.

30. Which of the following is not true?

1) $\overline{Z_1 + Z_2} = \overline{Z_1} + \overline{Z_2}$ 2) $\overline{Z_1\, Z_2} = \overline{Z_1}\,\overline{Z_2}$ 3) $Re(z) = \frac{\bar{Z}+z}{2}$ **4) $Im(z) = \frac{\bar{Z}-z}{2i}$**

31. If Z_1 and Z_2 are complex numbers then which of the following is meaningful?

1) $Z_1 < Z_2$ 2) $Z_1 > Z_2$ 3) $Z_1 \geq Z_2$ **4) $Z_1 \neq Z_2$**

32. Which of the following is incorrect?

1) $Re(Z) \leq |Z|$ 2) $Im(Z) \leq |Z|$ 3) $Z\bar{Z} = |\bar{Z}|^2$ **4)** $\boldsymbol{Re(Z) \geq |Z|}$

33. Which of the following is incorrect?

1) $|Z_1+Z_2| \leq |Z_1| + |Z_2|$ 2) $|Z_1-Z_2| \leq |Z_1| + |Z_2|$

3) $|Z_1-Z_2| \geq |Z_1| - |Z_2|$ **4)** $\boldsymbol{|Z_1+Z_2| \geq |Z_1| + |Z_2|}$

34. Which of the following is incorrect regarding nth roots of unity?

1) the number of distinct roots is n

2) the roots are in G.P. with common ratio $cis\ \frac{2\pi}{n}$

3) the arguments are in A.P. with common difference $\frac{2\pi}{n}$

4) product of the roots is 0 and the sum of the roots is ± 1

35. Which of the following are true?

i) If n is a positive integer then $(\cos\theta + i\sin\theta)^n = \cos n\theta + i\sin n\theta$

ii) If n is a negative integer then $(\cos\theta + i\sin\theta)^n = \cos n\theta - i\sin n\theta$

iii) If n is a fraction then $\cos n\theta + i\sin n\theta$ is one of the values of $(\cos\theta + i\sin\theta)^n$.

iv) If n is a negative integer then $(\cos\theta + i\sin\theta)^n = \cos n\theta + i\sin n\theta$

1) (i) , (ii) , (iii), (iv) **2) (i), (iii), (iv)** 3) (i), (iv) 4) (i) only

Chapter – 5 Two Dimensional Analytical geometry

1. The axis of the parabola y^2 −2y +8x−23 = 0 is

1) y = -1 2) x = -3 3) x = 3 **4) y = 1**

Ans : (y – 1)^2 = -8 (x – 3)

y-1 = 0

2. $16x^2 - 3y^2 - 32x - 12y - 44 = 0$ represents

1) an ellipse 2) a circle 3) a parabola **4) a hyperbola**

x^2 and y^2 sign are opposite .Therefore it is hyperbola

3. The line $4x + 2y = c$ is a tangent to the parabola $y^2 = 16x$ then c is

1) -1 2) -2 3) 4 4) -4

Ans : c = a/m

c = c/2 m = - 2

4. The point of intersection of the tangents at $t_1 = t$ and $t_2 = 3t$ to the parabola $y^2 = 8x$ is

1) $\boldsymbol{(6t^2, 8t)}$ 2) $(8t, 6t^2)$ 3) $(t^2, 4t)$ 4) $(4t, t^2)$

Ans : [at_1t_2 , a ($t_1 + t_2$)]

a = 2 $t_1 = t$ and $t_2 = 3t$

5. The length of the latus rectum of the parabola $y^2 - 4x + 4y + 8 = 0$ is

1) 8 2) 6 **3) 4** 4) 2

Ans : (y +)^2 = -4 (x +)

a = 1 Length of latus rectum = 4a

6. The directrix of the parabola $y^2 = x + 4$ is

1) $x = \frac{15}{4}$ 2) $x = -\frac{15}{4}$ **3) $x = -\frac{17}{4}$** 4) $x = \frac{17}{4}$

Ans : The directrix is X = -a : x + 4 = a where a = $\frac{1}{4}$

7. The length of the latus rectum of the parabola whose vertex is (2,-3) and the directrix $x = 4$ is

1) 2 2) 4 3) 6 **4) 8**

Ans : x = a = 2 : 4a = 8

8. The line $2x + 3y + 9 = 0$ touches the parabola $y^2 = 8x$ at the point

1) (0,-3) 2) (2,4) 3) $\left(-6, \frac{9}{2}\right)$ **4) $\left(\frac{9}{2}, -6\right)$**

Ans : $\left(\frac{a}{m^2}, \frac{2a}{m}\right)$ a = 2 m = -2/3

9. The eccentricity of the conic $9x^2 + 5y^2 - 54x - 40y + 116 = 0$ is

1) $\frac{1}{3}$ **2) $\frac{2}{3}$** 3) $\frac{4}{9}$ 4) $\frac{2}{\sqrt{5}}$

Ans : It is an ellipse .

$e = \sqrt{1 - \frac{S}{G}}$ S – smaller coefficient G – greater coefficient

10. The straight line $2x - y + c = 0$ is a tangent to the ellipse $4x^2 + 8y^2 = 32$ if c is

1) $\pm 2\sqrt{3}$ **2) ± 6** 3) 36 4) ± 4

Ans : $c^2 = a^2m + b^2$ $a^2 = 8$, $b^2 = 4$, m = 2

11. The radius of the director circle of the conic $9x^2 + 16y^2 = 144$ is

1) $\sqrt{7}$ 2) 4 3) 3 **4) 5**

Ans : Director circle is $x^2 + y^2 = a^2 + b^2$

12. The eccentricity of the hyperbola whose latus rectum is equal to half of its conjugate axis is

1) $\frac{\sqrt{3}}{2}$ 2) $\frac{5}{3}$ 3) $\frac{3}{2}$ **4) $\frac{\sqrt{5}}{2}$**

Ans : $\frac{2b^2}{a} = b$ a = 2b $\frac{b^2}{a^2} = \frac{1}{4}$

$e = \sqrt{1 + \frac{b^2}{a^2}}$

13. The line $5x - 2y + 4k = 0$ is a tangent to $4x^2 - y^2 = 36$ then k is

1) $\frac{4}{9}$ 2) $\frac{2}{3}$ **3) $\frac{9}{4}$** 4) $\frac{81}{16}$

Ans : $c^2 = a^2m + b^2$

$k^2 = \frac{81}{16}$

14. If the centre of the ellipse is (2,3) one of the foci is (3,3) then the other focus is

1) (1,3) 2) (-1,3) 3) (1,-3) 4) (-1,-3)

15. Centre of the ellipse $\frac{x^2}{25}+\frac{y^2}{9}=1$ is

1) (0,0) 2) (5,0) 3) (3,5) 4) (0,5)

16. The point of contact of the tangent $y = mx + c$ and the parabola $y^2 = 4ax$ is

1) $\left(\frac{a}{m^2},\frac{2a}{m}\right)$ 2) $\left(\frac{2a}{m^2},\frac{a}{m}\right)$ 3) $\left(\frac{a}{m},\frac{2a}{m^2}\right)$ 4) $\left(\frac{-a}{m^2},\frac{-2a}{m}\right)$

17. The point of contact of the tangent $y = mx+c$ and the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is

1) $\left(\frac{b^2}{c},\frac{a^2m}{c}\right)$ **2)** $\left(\frac{-a^2m}{c},\frac{b^2}{c}\right)$ 3) $\left(\frac{a^2m}{c},\frac{-b^2}{c}\right)$ 4) $\left(\frac{-a^2m}{c},\frac{-b^2}{c}\right)$

18. The point of contact of the tangent $y = mx + c$ and the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ is

1) $\left(\frac{am^2}{c},\frac{b^2}{c}\right)$ 2) $\left(\frac{a^2m}{c},\frac{b^2}{c}\right)$ **3)** $\left(\frac{-a^2m}{c},\frac{-b^2}{c}\right)$ 4) $\left(\frac{-am^2}{c},\frac{-b^2}{c}\right)$

19. The true statements of the following are

i) Two tangents and 3 normal can be drawn to a parabola from a point

ii) Two tangents and 4 normal can be drawn to an ellipse from a point

iii) Two tangents and 4 normal can be drawn to an hyperbola from a point

iv) Two tangents and 4 normal can be drawn to an R.H. from a point

1) (i),(ii),(iii) and (iv) 2) (i),(ii) only 3) (iii),(iv) only **4) (i),(ii),and(iii)**

20. The condition that the line $lx + my + n = 0$ may be normal to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is

1) $al^3 + 2alm^2 + m^2n = 0$ 2) $\frac{a^2}{l^2}+\frac{b^2}{m^2}=\frac{(a^2+b^2)^2}{n^2}$

3) $\frac{a^2}{l^2}+\frac{b^2}{m^2}=\frac{(a^2-b^2)^2}{n^2}$ 4) $\frac{a^2}{l^2}-\frac{b^2}{m^2}=\frac{(a^2+b^2)^2}{n^2}$

21. The condition that the line $lx + my + n = 0$ may be normal to the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ is

1) $al^3 + 2alm^2 + m^2n = 0$ 2) $\frac{a^2}{l^2}+\frac{b^2}{m^2}=\frac{(a^2+b^2)^2}{n^2}$

3) $\frac{a^2}{l^2}+\frac{b^2}{m^2}=\frac{(a^2-b^2)^2}{n^2}$ **4)** $\frac{a^2}{l^2}-\frac{b^2}{m^2}=\frac{(a^2+b^2)^2}{n^2}$

22. The condition that the line $lx + my + n = 0$ may be normal to the parabola $y^2 = 4ax$ is

1) $al^3 + 2alm^2 + m^2n = 0$ 2) $\frac{a^2}{l^2}+\frac{b^2}{m^2}=\frac{(a^2+b^2)^2}{n^2}$

3) $\frac{a^2}{l^2}+\frac{b^2}{m^2}=\frac{(a^2-b^2)^2}{n^2}$ 4) $\frac{a^2}{l^2}-\frac{b^2}{m^2}=\frac{(a^2+b^2)^2}{n^2}$

23. The point of intersection of tangents at 't_1' and 't_2' to the parabola $y^2 = 4ax$ is

1) $(a(t_1+t_2), at_1t_2)$ **2)** $(at_1t_2, a(t_1+t_2))$

3) $(at^2, 2at)$ 4) $(at_1t_2, a(t_1-t_2))$

Chapter – 6 Application of Vector algebra

1. If $\vec{u} = \vec{a} \times (\vec{b} \times \vec{c}) + \vec{b} \times (\vec{c} \times \vec{a}) + \vec{c} \times (\vec{a} \times \vec{b})$, then

1) u is a unit vector 2) $\vec{u} = \vec{a} + \vec{b} + \vec{c}$ **3) $\vec{u} = \vec{0}$** 4) $\vec{u} \neq \vec{0}$

Ans : RHS is always zero

2. If $\vec{a} \times (\vec{b} \times \vec{c}) + \vec{b} \times (\vec{c} \times \vec{a}) + \vec{c} \times (\vec{a} \times \vec{b}) = \vec{x} \times \vec{y}$ then

1) $\vec{x} = \vec{0}$ 2) $\vec{y} = \vec{0}$

3) $\vec{x}$ *and* $\vec{y}$ *are parallel* **4) $\vec{x} = \vec{0}$ or $\vec{y} = \vec{0}$ or $\vec{x}$ *and* $\vec{y}$ *are parallel***

Ans : L.H.S = 0 $\vec{x} \times \vec{y} = 0$

3. If $\vec{a} \times (\vec{b} \times \vec{c}) = (\vec{a} \times \vec{b}) \times \vec{c}$ for non-coplanar vectors $\vec{a}, \vec{b}, \vec{c}$ then

1) $\vec{a}$ *parallel to* $\vec{b}$ 2) $\vec{b}$ *parallel to* $\vec{c}$

3) $\vec{c}$ *parallel to* $\vec{a}$ 4) $\vec{a} + \vec{b} + \vec{c} = \vec{0}$

4. If a line makes $45°, 60°$ with positive direction of axes x and y then the angle it makes with the z axis is

1) 30° 2) 90° 3) 45° **4) 60°**

Ans : $cos^2\alpha + cos^2\beta + cos^2\gamma = 1$

$\gamma = 60°$

5. If $[\vec{a} \times \vec{b}, \ \vec{b} \times \vec{c}, \ \vec{c} \times \vec{a}] = 64$ then $[\vec{a}, \vec{b}, \vec{c}]$ *is*

1) 32 **2) 8** 3) 128 4) 0

Ans : $= [\vec{a}, \vec{b}, \vec{c}]^2$

6. If $[\vec{a} + \vec{b}, \ \vec{b} + \vec{c}, \ \vec{c} + \vec{a}] = 8$ then $[\vec{a}, \vec{b}, \vec{c}]$ is

1) 4 2) 16 3) 32 4) -4

Ans : $[\vec{a} + \vec{b}, \ \vec{b} + \vec{c}, \ \vec{c} + \vec{a}] = 2[\vec{a}, \vec{b}, \vec{c}]$

7. The value of $[\vec{i} + \vec{j}, \ \vec{j} + \vec{k}, \ \vec{k} + \vec{i}]$ is equal to

1) 0 2) 1 **3) 2** 4) 4

Ans : $[\vec{i} + \vec{j}, \ \vec{j} + \vec{k}, \ \vec{k} + \vec{i}] = 2[\vec{i}, \ \vec{j}, \ \vec{k}]$

8. The shortest distance of the point (2,10,1) from the plane $\vec{r}.(3\vec{i} - \vec{j} + 4\vec{k}) = 2\sqrt{26}$ is

1) $2\sqrt{26}$ 2) $\sqrt{26}$ **3) 2** 4) $\frac{1}{\sqrt{26}}$

Ans : Distance of the point from plane is $\left|\frac{ax+by+bz+d}{\sqrt{a^2+b^2+c^2}}\right|$

Point (x , y , z) = (2 , 10 , 1) (a , b , c) = (3 , -1 , 4) d = -2$\sqrt{26}$

9. The vector $(\vec{a} \times \vec{b}) \times (\vec{c} \times \vec{d})$ is

1) perpendicular to $\vec{a}, \vec{b}, \vec{c}$ *and* $\vec{d}$ 2) parallel to the vectors $(\vec{a} \times \vec{b})$ *and* $(\vec{c} \times \vec{d})$

3) parallel to the line of intersection of the plane containing $\vec{a}$ and $\vec{b}$ and the plane containing $\vec{c}$ and $\vec{d}$

4) perpendicular to the line of intersection of the plane containing $\vec{a}$ and $\vec{b}$ and the plane containing $\vec{c}$ and $\vec{d}$

10. If $\vec{a},\vec{b},\vec{c}$ are a right handed triad of mutually perpendicular vectors of magnitude a, b, c then the value of $[\vec{a}\ \ \vec{b}\ \ \vec{c}]$ is

1) $a^2b^2c^2$ 2) 0 3) $\frac{1}{2}abc$ **4) abc**

Ans : They are mutually perpendicular . the box prduct becomes the volume of a cuboid

11. If $\vec{a},\vec{b},\vec{c}$ are non-coplanar and $[\vec{a}\times\vec{b},\ \vec{b}\times\vec{c},\ \ \vec{c}\times\vec{a}] = [\vec{a}+\vec{b},\ \vec{b}+\vec{c},\ \ \vec{c}+\vec{a}]$ then $[\vec{a},\vec{b},\vec{c}]$ is

1) 2 2) 3 3) 1 4) 0

Ans : $[\vec{a},\ \vec{b},\ \ \vec{c}]^2 = 2[\vec{a},\ \vec{b},\ \ \vec{c}]$

12. $\vec{r} = s\vec{i} + t\vec{j}$ is the equation of

1) a straight line joining the points $\vec{i}$ and $\vec{j}$ **2) xoy plane**

3) yoz plane 4) zox plane

Ans : $\vec{r}$ is made up of $\vec{i}$ and $\vec{j}$

13. If the magnitude of moment about the point $\vec{j}+\vec{k}$ of a force $\vec{i}+a\vec{j}-\vec{k}$ acting through the point $\vec{i}+\vec{j}$ is $\sqrt{8}$ then the value of a is

1) 1 **2) 2** 3) 3 4) 4

Ans : $\vec{r} = (\vec{i}+\vec{j}) - (\vec{j}+\vec{k}) = \vec{i}-\vec{k}$ $\vec{F} = \vec{i}+a\vec{j}-\vec{k}$

$\vec{r}\times\vec{F} = a\,(\vec{i}+\vec{k})$

Taking modulus you will get a = 2

14. The point of intersection of the line $\vec{r} = (\vec{i}-\vec{k}) + t(3\vec{i}+2\vec{j}+7\vec{k})$ and the plane $\vec{r}.(\vec{i}+\vec{j}-\vec{k}) = 8$ is

1) (8,6,22) **2) (-8,-6,-22)** 3) (4,3,11) 4) (-4,-3,-11)

Ans : Line : $\frac{x-1}{3} = \frac{y}{2} = \frac{z+1}{7}$ Plane is x + y -z -8 = 0

Choose the point which satisfies the above equation

15. The equation of the plane passing through the point (2,1,-1) and the line of intersection of the planes $\vec{r}.(\vec{i}+3\vec{j}-\vec{k}) = 0$ and $\vec{r}.(\vec{j}+2\vec{k}) = 0$ is

1) $x+4y-z=\mathbf{0}$ **2) $x+9y+11z=0$**

3) $2x+y-z+5=0$ 4) $2x-y+z=0$

Ans : The required plane is (x + 3y -k) + λ (y + 2k) = 0

It passes through (2 , 1 , -1) λ = 6

$x + 9y + 11z = 0$

16. The point of intersection of the lines $\frac{x-6}{-6} = \frac{y+4}{4} = \frac{z-4}{-8}$ *and* $\frac{x+1}{2} = \frac{y+2}{4} = \frac{z+3}{-2}$ is

1) (0,0,-4) 2) (1,0,0) 3) (0,2,0) 4) (1,2,0)

Ans : Select the point which satisfies both equations separately . (o , 0 , -4) satisfies both

17. The following lines are $\frac{x-1}{2} = \frac{y-1}{-1} = \frac{z}{1}$ *and* $\frac{x-2}{3} = \frac{y-1}{-5} = \frac{z-1}{2}$

1) parallel 2) intersecting **3) skew** 4) perpendicular

Ans : Given two lines are neither perpendicular nor parallel

$[\vec{a}_2 - \vec{a}_1, \vec{u}, \vec{v}] \neq 0$They are not intersecting

18. If $\vec{a}, \vec{b}, \vec{c}$ are three mutually perpendicular unit vectors, then $|\vec{a} + \vec{b} + \vec{c}| =$

1) 3 2) 9 3) $3\sqrt{3}$ **4) $\sqrt{3}$**

19. The angle between the line $\bar{r} = \bar{a} + t\bar{b}$ and the plane $\bar{r}.\bar{n} = q$ is connected by the relation.

1) $\cos\theta = \frac{\vec{a}.\vec{n}}{q}$ 2) $\cos\theta = \frac{\vec{b}.\vec{n}}{|\vec{b}||\vec{n}|}$ 3) $\sin\theta = \frac{\vec{a}.\vec{b}}{|\vec{n}|}$ **4) $\sin\theta = \frac{\vec{b}.\vec{n}}{|\vec{b}||\vec{n}|}$**

20. The d.c.s of a vector whose direction ratios are 2,-3,-6 are

1) $\left(\frac{2}{7}, \frac{-3}{7}, \frac{-6}{7}\right)$ 2) $\left(\frac{2}{49}, \frac{3}{49}, \frac{-6}{49}\right)$ 3) $\left(\frac{\sqrt{2}}{7}, \frac{\sqrt{3}}{7}, \frac{-\sqrt{6}}{7}\right)$ 4) $\left(\frac{2}{7}, \frac{3}{7}, \frac{6}{7}\right)$

21. The distance from the origin to the plane $\vec{r}.(2\vec{i} - \vec{j} + 5\vec{k}) = 7$ is

1) $\frac{7}{\sqrt{30}}$ 2) $\frac{\sqrt{30}}{7}$ 3) $\frac{30}{7}$ 4) $\frac{7}{30}$

Ans : Distance from origin to plane is $\left|\frac{d}{\sqrt{a^2+b^2+c^2}}\right|$

(a , b , c) = (2 , -1 , 5) d = 7

22. The vector equation of a plane passing through a point where P, V is $\vec{a}$ and perpendicular to a vector $\vec{n}$ is

1) $\vec{r}.\vec{n} = \vec{a}.\vec{n}$ 2) $\vec{r} \times \vec{n} = \vec{a} \times \vec{n}$ 3) $\vec{r} + \vec{n} = \vec{a} + \vec{n}$ 4) $\vec{r} - \vec{n} = \vec{a} - \vec{n}$

23. The vectors equation of a plane whose distance from the origin is p and perpendicular to a vector $\vec{n}$ is

1) $\vec{r}.\vec{n} = p$ 2) $\vec{r}.\hat{n} = q$ 3) $\vec{r} \times \vec{n} = p$ **4) $\vec{r}.\hat{n} = p$**

24. The non-parametric vector equation of a plane passing through a point whose P. V is$\vec{a}$ and parallel to $\vec{u}$ and $\vec{v}$ is

1) $[\vec{r} - \vec{a}, \vec{u}, \vec{v}] = 0$ 2) $[\vec{r}, \vec{u}, \vec{v}] = 0$ 3) $[\vec{r}, \vec{a}, \vec{u} \times \vec{v}] = 0$ 4) $[\vec{a}, \vec{u}, \vec{v}] = 0$

25. The non parametric vector equation of a plane passing through the point whose P. V s are $\vec{a}$ and parallel to $\vec{u}$ *and* $\vec{v}$ is

1) **$[\vec{r} - \vec{a} \;\; \vec{b} - \vec{a} \;\; \vec{v}] = 0$** 2) $[\vec{r} \;\; \vec{b} - \vec{a} \;\; \vec{v}] = 0$ 3) $[\vec{a} \;\; \vec{b} \;\; \vec{v}] = 0$ 4) $[\vec{r} \;\; \vec{a} \;\; \vec{b}] = 0$

26. The non-parametric vector equation of a plane passing through three points whose P. Vs are $\vec{a}, \vec{b}, \vec{c}$ is

1) $[\vec{r}-\vec{a}\ \vec{b}-\vec{a}\ \vec{c}-\vec{a}]=0$ 2) $[\vec{r}\ \vec{a}\ \vec{b}]=0$ 3) $[\vec{r}\ \vec{b}\ \vec{c}]=0$ 4) $[\vec{a}\ \vec{b}\ \vec{c}]=0$

27. The vector equation of a plane passing through the line of intersection the planes $\bar{r}.\overline{n_1}=q_1$ and $\bar{r}.\overline{n_2}=q_2$ is

1) $(\vec{r}.\overrightarrow{n_1}-q_1)+\lambda(\vec{r}.\overrightarrow{n_2}-q_2)=0$

2) $\vec{r}.\overrightarrow{n_1}+\vec{r}.\overrightarrow{n_2}=q_1+\lambda q_2$

3) $\vec{r}\times\overrightarrow{n_1}+\vec{r}\times\overrightarrow{n_2}=q_1+q_2$

4) $\vec{r}\times\overrightarrow{n_1}-\vec{r}\times\overrightarrow{n_2}=q_1+q_1$

+2 MATHS
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4.Full Portion Test (10 tests) [EM]

5.Chapterwise (20 tests) [EM]

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Chapter – 7 Application of differential calculus

1. The velocity v of a particle moving along a straight line when at a distance x from the origin is given by $a + bv^2 = x^2$ where a and b are constants. Then the acceleration is

1) $\frac{b}{x}$ 2) $\frac{a}{x}$ **3)** $\boldsymbol{\frac{x}{b}}$ 4) $\frac{x}{a}$

Hint : $a + bv^2 = x^2$

$$2b\frac{dv}{dt} = 2x$$

$$\frac{dv}{dt} = \frac{x}{b}$$

2. A spherical snowball is melting in such a way that its volume is decreasing at a rate of 1 cm^3 / min. The rate at which the diameter is decreasing when the diameter is 10 cm is

1) $\frac{-1}{50\pi}cm/min$ **2)** $\boldsymbol{\frac{1}{50\pi}cm/min}$ 3) $\frac{-11}{75\pi}cm/min$ 4) $\frac{-2}{75\pi}cm/min$

Hint : $V = \frac{4}{3}\pi r^3$ $\frac{dV}{dt} = -1$ $r = \frac{D}{2}$

Sub in volume formula and differentiate with respect to t

$\frac{dD}{dt} = \frac{-2}{\pi D^2}$ where D = 10cm

$$\frac{dD}{dt} = \frac{-1}{50\pi}$$

diameter is decreasing so

$$\frac{dD}{dt} = \frac{1}{50\pi}$$

3. The slope of the normal to the curve $y = 3x^2$ at the point whose x coordinate is 2 is

1) $\frac{1}{13}$ 2) $\frac{1}{14}$ **3)** $\boldsymbol{\frac{-1}{12}}$ 4) $\frac{1}{12}$

Hint : $\frac{dy}{dx} = 6x$

Slope of normal $= \frac{-1}{6x}$ sub x = 2 and we get Slope of normal $=\frac{-1}{12}$

4. The point on the curve $y = 2x^2 - 6x - 4$ at which the tangent is parallel to the x – axis is

1) $\left(\frac{5}{2}, \frac{-17}{2}\right)$ 2) $\left(\frac{-5}{2}, \frac{-17}{2}\right)$ 3) $\left(\frac{-5}{2}, \frac{17}{2}\right)$ **4)** $\boldsymbol{\left(\frac{3}{2}, \frac{-17}{2}\right)}$

Hint : tangent is parallel to the x – axis means $\frac{dy}{dx} = 0$

$$y = 2x^2 - 6x - 4$$

$$\frac{dy}{dx} = 4x - 6$$

$$x = \frac{3}{2}$$

5. The equation of the tangent to the curve $y = \frac{x^3}{5}$ at the point $\left(-1, -\frac{1}{5}\right)$ is

1) $5y + 3x = 2$ **2)** $\boldsymbol{5y - 3x = 2}$ 3) $3x - 5y = 2$ 4) $3x + 3y = 2$

Hint : $\frac{dy}{dx} = \frac{3x^2}{5}$

At $\left(-1, -\frac{1}{5}\right)$ $m = \frac{dy}{dx} = \frac{3}{5}$

Equation of tangent $y - y_1 = m(x - x_1)$

Sub known values in above equation you get

$5y - 3x = 2$

6. The equation of the normal to the curve $\theta = \frac{1}{t}$ at the point $\left(-3, -\frac{1}{3}\right)$ is

1) 3 θ = 27 t – 80 2) 5 θ = 27t – 80

3) 3 θ = 27 *t* + 80 4) $\theta = \frac{1}{t}$

Same as Q.No 5

Equation of normal $y - y_1 = \frac{-1}{m}(x - x_1)$

7. The angle between the curves $\frac{x^2}{25} + \frac{y^2}{9} = 1$ and $\frac{x^2}{8} - \frac{y^2}{8} = 1$ is

1) $\frac{\pi}{4}$ 2) $\frac{\pi}{3}$ 3) $\frac{\pi}{6}$ **4) $\frac{\pi}{2}$**

Hint : Option having $\frac{\pi}{2}$ so try for perpendicular

If $a^2 = b^2 + c^2 + d^2$

25 = 9 +8 +8 Hence it is true

8. The angle between the curve $y = e^{mx}$ and $y = e^{-mx}$ for $m > 1$ is

1) $\tan^{-1}\left(\frac{2m}{m^2-1}\right)$ 2) $\tan^{-1}\left(\frac{2m}{1-m^2}\right)$ 3) $\tan^{-1}\left(\frac{-2m}{1+m^2}\right)$ 4) $\tan^{-1}\left(\frac{2m}{m^2+1}\right)$

9. If the normal to the curve $x^{2/3} + y^{2/3} = a^{2/3}$ makes an angle θ with the x –axis then the slope of the normal is

1) – cot θ **2) tan θ** 3) – tan θ 4) cot θ

Hint : If any line (tangent or normal) makes and angle θ with the x – axis then the slope of normal is tan θ

10. If a and b are two roots of a polynomial f (x) = 0 then Rolle's theorem says that there exists atleast

1) one root between a and b for f ′ (x) = 0

2) two roots between a and b for f ′ (x) = 0

3) one root between a and b for f ″ (x) = 0

4) two roots between a and b for f ″ (x) = 0

11. What is the surface area of a sphere when the volume is increasing at the same rate as its radius?

1) 1 2) $\frac{1}{2\pi}$ 3) 4π 4) $\frac{4\pi}{3}$

Hint : $\frac{dV}{dt} = \frac{dr}{dt}$ $V = \frac{4}{3}\pi r^3$ $S = 4\pi r^2$

12. For what values of x is the rate of increase of $x^3 - 2x^2 + 3x + 8$ is twice the rate of increase of x

1) $\left(-\frac{1}{3}, -3\right)$ 2) $\left(\frac{1}{3}, 3\right)$ 3) $\left(-\frac{1}{3}, 3\right)$ **4) $\left(\frac{1}{3}, 1\right)$**

Hint : $(3x^2 - 4x + 3\,)dx = 2dx$

On solving you will get $x = \left(\frac{1}{3}, 1\right)$

13. Identify the correct statement:

i) a continuous function has local maximum then it has absolute maximum

ii) a continuous function has local minimum then it has absolute minimum

iii) a continuous function has absolute maximum then it has local maximum

iv) a continuous function has absolute minimum then it has local minimum

1) (i) and (ii) 2) (i) and (iii) 3) (iii) and (iv) 4) (i) , (iii) and (iv)

14. If $y = 6x - x^3$ and x increases at the rate of 5 unit per second, the rate of change of slope when $x = 3$ is

1) − 90 units / sec 2) 90 units / sec 3) 180 units / sec 4) − 180 units / sec

Hint : $\frac{dx}{dt} = 5$ **:** x = 3 $m = \frac{dy}{dx} = 6 - 3x^2$

$$\frac{dm}{dt} = -6x\frac{dx}{dt}$$

Sub known value $\frac{dm}{dt} = -90$

15. Identify the false statement:

1) all the stationary numbers are critical numbers

2) at the stationary point the first derivative is zero

3) at critical numbers the first derivative need not exist

4) all the critical numbers are stationary numbers

16. The gradient of the tangent to the curve $y = 8 + 4x - 2x^2$ at the point where the curve cuts the y-axis is

1) 8 **2) 4** 3) 0 4) − 4

Hint : point where the curve cuts the y-axis means $x = 0$

To find $\frac{dy}{dx}$ $at\ x = 0$

17. The Angle between the parabolas $y^2 = x$ and $x^2 = y$ at the origin is

1) $2\tan^{-1}\left(\frac{3}{4}\right)$ 2) $\tan^{-1}\left(\frac{4}{3}\right)$ **3)** $\boldsymbol{\frac{\pi}{2}}$ 4) $\frac{\pi}{4}$

18. For the curve $x = e^t \cos t$; $y = e^t \sin t$ the tangent line is parallel to the $x - axis$ when t is equal to

1) $\boldsymbol{-\frac{\pi}{4}}$ 2) $\frac{\pi}{4}$ 3) 0 4) $\frac{\pi}{2}$

Hint : $\frac{dy}{dx} = 0$

19. If a normal makes an angle θ with positive x −axis then the slope of the curve at the point where the normal is drawn is

1) − cot θ 2) tan θ 3) − tan θ 4) cot θ

Hint : m = Slope of tangent = tan θ

slope of normal = $\frac{-1}{m}$

20. The value of $'a'$ so that the curves $y = 3e^x$ and $y = \frac{a}{3}\, e^{-x}$ intersect orthogonally is

1) -1 **2) 1** 3) $\frac{1}{3}$ 4) 3

$m_1 = 3e^x$ $m_2 = -\frac{a}{3}\, e^{-x}$

$m_1 m_2 = -1$

21. If $s = t^3 - 4t^2 + 7$, the velocity when the acceleration is zero is

1) $\frac{32}{3}\ m/sec$ **2)** $\boldsymbol{\frac{-16}{3}\ m/sec}$ 3) $\frac{16}{3}\ m/sec$ 4) $\frac{-32}{3}\ m/sec$

Hint : $v = 3t^2 - 8t$; $a = 6t - 8$

acceleration is zero which means $6t - 8 = 0$

$v\ at\ t = \frac{4}{3}$ $v = \frac{-16}{3}$

22. The statement "If f is continuous on a closed interval [a, b] then f attains an absolute maximum value f (c) and an absolute minimum value f(d) at some number c and d in [a , b]" is

1) The extreme value theorem 2) Fermat's theorem

3) Law of Mean 4) Rolle's theorem

23. The Rolle's constant for the function $y = x^2$ on $[-2, 2]$ is

1) $\frac{2\sqrt{3}}{3}$ **2) 0** 3) 2 4) -2

Hint : $c = \frac{a+b}{2} = 0$

24. $\lim_{x\to\infty} \frac{x^2}{e^x}$ is =

Hint : 1) 2 **2) 0** 3) ∞ 4) 1

25. $\lim_{x\to 0}\frac{a^x-b^x}{c^x-d^x} =$

Hint : 1) ∞ 2) 0 3) $\log\frac{ab}{cd}$ **4) $\log\frac{\left(\frac{a}{b}\right)}{\left(\frac{c}{d}\right)}$**

26. Which of the following function is increasing in $(0,\infty)$

1) e^x 2) $\frac{1}{x}$ 3) $-x^2$ 4) x^{-2}

Hint : e^x is always increasing function irrespective of interval

27. The function $y = \tan x - x$ is

1) an increasing function in $\left(0,\frac{\pi}{2}\right)$

2) a decreasing function in $\left(0,\frac{\pi}{2}\right)$

3) increasing in $\left(0,\frac{\pi}{4}\right)$ and decreasing in $\left(\frac{\pi}{4},\frac{\pi}{2}\right)$

4) decreasing in $\left(0,\frac{\pi}{4}\right)$ and increasing in $\left(\frac{\pi}{4},\frac{\pi}{2}\right)$

Hint : $y' = sec^2x - 1 = tan^2x > 0$ for $x \in \left(0,\frac{\pi}{2}\right)$

28. The curve $y = -e^{-x}$ is

1) concave upward for $x > 0$ 2) concave downward for $x > 0$

2) everywhere concave upward **4) everywhere concave downward**

Hint : $y'' = -e^{-x} < 0$

29. The point of inflexion of the curve $y = x^4$ is at

1) $x = 0$ 2) $x =$ 3) $x = 12$ **4) nowhere**

$y'' = 12x^2$

Hint : $y'' = 0$ $x = 0$

For x < 0 , $y'' > 0$ and for x > 0 , $y'' > 0$

Therefore no change of sign .

Hence it has no point of inflection

30. The curve $y = ax^3 + bx^2 + cx + d$ has a point of inflexion at $x = 1$ then

1) $a + b = 0$ 2) $a + 3b = 0$ **3) $3a + b = 0$** 4) $3a + b = 1$

Hint : The curve $y = ax^3 + bx^2 + cx + d$ has a point of inflexion at $x = 1$ means $y''(1) = 0$

$y'' = 6ax + 2b$

At x = 1 , $6a + 2b = 0$

31. The distance – time relationship of a moving body is given by y = F (t) then the acceleration of the body is the

1) gradient of the velocity / time graph 2) gradient of the distance / time graph

3) gradient of the acceleration / distance graph 4) gradient of the velocity / distance graph

32. A continuous graph y = f (x)is such that $f'(x) \to \infty$ *as* $x \to x_1, at\ (x_1, y_1)$. Then y = f (x) has a
1) vertical tangent $y = x_1$ 2) horizontal tangent $x = x_1$
3) vertical tangent $x = x_1$ 4) horizontal tangent $y = y_1$

33. The curve y = f (x) and y = g (x) cut orthogonally if at the point of intersection
1) slope of f (x) = slope of g (x) 2) slope of f (x) + slope of g (x) = 0
3) slope of f (x) / slope of g (x) = −1 **4) [slope of f (x)] [slope of g (x)] = −1**

34. *l* ‘ Hopital’s rule cannot be applied to $\frac{x+1}{x+3}$ as $x \to 0$ because $f(x) = x + 1$ *and* $g(x) = x + 3$ are
1) not continuous 2) not differentiable
3) not in the in determine form as $x \to 0$ 4) in the in determine form as $x \to 0$

35. If $\lim_{x\to a} g(x) = b$ *and* f is continuous at $x = b$ then
1) $\lim_{x\to a} g(f(x)) = f(\lim_{x\to a} g(x))$ **2) $\lim_{x\to a} f(g(x)) = f[\lim_{x\to a} g(x)]$**
3) $\lim_{x\to a} f(g(x)) = g(\lim_{x\to a} f(x))$ 4) $\lim_{x\to a} f(g(x)) \neq f(\lim_{x\to a} g(x))$

36. $\lim_{x\to 0} \frac{x}{\tan x}$ *is*
1) 1 2) −1 3) 0 4) ∞

37. If the gradient of a curve changes from positive just before P to negative just after then “P” is a
1) minimum point **2) maximum point** 3) inflection point 4) discontinuous point

38. If f has a local extremum at a and if f ′(a) exists then
1) f ′ (a) < 0 2) f ′ (a) > 0 **3) f ′ (a) = 0** 4) f ′′ (a) = 0

39. The point that separates the convex part of a continuous curve from the concave part is
1) the maximum point 2) the minimum point **3) the inflection** 4) critical point

40. x = x_0 is a root of even order for the equation f ′ (x) = 0 then x = x_0 is a
1) maximum point 2) minimum point **3) inflection point** 4) critical point

41. If x_0 is the x - coordinate of the point of inflection of a curve y = f (x) then (Second derivative exists)
1) $f(x_0) = 0$ 2) $f'(x_0) = 0$ **3) $f''(x_0) = 0$** 4) $f''(x_0) \neq 0$

Chapter – 8 Differential And Partial Derivatives

1. If $u = x^y$ then $\frac{\partial u}{\partial x}$ is equal to

1) $\boldsymbol{yx^{y-1}}$ 2) $u \log x$ 3) $u \log y$ 4) xy^{x-1}

Hint : Treat y as constant $\frac{\partial u}{\partial x} = yx^{y-1}$

2. If $\sin^{-1}\left(\frac{x^4+y^4}{x^2+y^2}\right)$ and f = sin u then f is a homogeneous function of degree

1) 0 2) 1 **3) 2** 4) 4

Hint : For the function $\frac{x^4+y^4}{x^2+y^2}$, the numerator degree is 4 and the denominator degree is 2

Degree of f = 4 – 2 = 2

3. If $= \frac{1}{\sqrt{x^2+y^2}}$, then $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$ is equal to

1) $\frac{1}{2}u$ 2) u 3) $\frac{3}{2}u$ **4)** $\boldsymbol{-u}$

Hint : The degree of u is - 1

4. If $x = r\cos\theta, y = r\sin\theta$, then $\frac{\partial r}{\partial x}$ is equal to

1) sec θ 2) sin θ **3) cos θ** 4) cosec θ

$x^2 + y^2 = r^2$

$2x = 2r\frac{\partial r}{\partial x}$

$\frac{\partial r}{\partial x} = \frac{x}{r} = \frac{r\cos\theta}{r} = \cos\theta$

5. Identify the true statements in the following:

(i) If a curve is symmetrical about the origin, then it is symmetrical about both axes.

(ii) If a curve is symmetrical about both the axes, then it is symmetrical about the origin.

(iii) A curve $f(x, y) = 0$ is symmetrical about the line $y = x$ if $f(x, y) = f(y, x)$.

(iv) For the curve $f(x, y) = 0$, if $f(x, y) = f(-y, -x)$, then it is symmetrical about the origin.

1) (ii), (iii) 2) (i), (iv) 3) (i), (iii) 4) (ii), (iv)

6. The percentage error in the 11th root of the number 28 is approximately ______ times the percentage error in 28.

1) $\frac{1}{28}$ **2)** $\boldsymbol{\frac{1}{11}}$ 3) 11 4) 28

Hint : The percentage error in the n[th] root of any number is approximately $\frac{1}{n}$ times the percentage error in that number .Therefore $\frac{1}{11}$ times

7. If $u = f\left(\frac{y}{x}\right)$ then $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$ is equal to

1) 0 2) 1 3) $2u$ 4) u

Hint : The degree of u is zero

8. If $u = f(x, y)$ then with usual notations, $u_{xy} = u_{yx}$ if

1) u is continuous 2) u_x is continuous

3) u_y is continuous **4) u, u_x, u_y are continuous**

9. If $u = f(x, y)$ is a differentiable function of x and y; x and y are differentiable functions of t then

1) $\frac{du}{dt} = \frac{\partial f}{\partial x}.\frac{\partial x}{\partial t} + \frac{\partial f}{\partial y}.\frac{\partial y}{\partial t}$ 2) $\frac{du}{dt} = \frac{\partial f}{\partial x}.\frac{dx}{dt} + \frac{\partial t}{\partial y}.\frac{\partial y}{\partial t}$

3) $\frac{du}{dt} = \frac{\partial f}{\partial x}.\frac{dx}{dt} + \frac{\partial f}{\partial y}.\frac{dy}{dt}$ 4) $\frac{\partial u}{\partial t} = \frac{\partial f}{\partial x}.\frac{\partial x}{\partial t} + \frac{\partial f}{\partial y}.\frac{\partial y}{\partial t}$

10. The differential on y of the function $y = \sqrt[4]{x}$ is

1) $\frac{1}{4}x^{-3/4}$ **2) $\frac{1}{4}x^{-3/4}\,dx$** 3) $x^{-3/4}\,dx$ 4) 0

11. The differential of y if $y = \sqrt{x^4 + x^2 + 1}$ is

1) $\frac{1}{2}(4x^3 + 2x)^{\frac{-1}{2}}dx$ **2) $\frac{1}{2}(x^4 + x^2 + 1)^{\frac{-1}{2}}(4x^3 + 2x)dx$**

3) $\frac{1}{2}(4x^3 + 2x)^{\frac{-1}{2}}$ 4) $\frac{1}{2}(x^4 + x^2 + 1)^{\frac{-1}{2}}(4x^3 + 2x)$

12. The differential of $x\tan x$ *is*

1) $(x\,sec^2x + tan^2x)$ 2) $(x\,sec^2x - \tan x)dx$

3) $x\,sec^2x\,dx$ **4) $(x\,sec^2x + \tan x)dx$**

Chapter – 9 Application of integration

1. The value of $\int_0^{\frac{\pi}{2}} \frac{cos^{5/3}x}{cos^{5/3}x + sin^{5/3}x}dx$ is

1) $\frac{\pi}{2}$ **2) $\frac{\pi}{4}$** 3) 0 4) π

Hint : $I = f(x) = \int_0^{\frac{\pi}{2}} \frac{cos^{5/3}x}{cos^{5/3}x + sin^{5/3}x}dx$

$I = f(a - x) = \int_0^{\frac{\pi}{2}} \frac{sin^{5/3}x}{cos^{5/3}x + sin^{5/3}x}dx$

$2I = \int_0^{\frac{\pi}{2}} dx = \frac{\pi}{2}$

2. The value of $\int_0^{\frac{\pi}{2}} \frac{\sin x - \cos x}{1+\sin x \cos x} dx$ is

1) $\frac{\pi}{2}$ **2) 0** 3) $\frac{\pi}{4}$ 4) π

Hint : $I = f(x) \int_0^{\frac{\pi}{2}} \frac{\cos x - \sin x}{1 + \sin x \cos x} dx$

$2I = 0$

3. The value of $\int_0^1 x(1-x)^4 \ dx$ is

1) $\frac{1}{12}$ **2)** $\mathbf{\frac{1}{30}}$ 3) $\frac{1}{24}$ 4) $\frac{1}{20}$

Hint : $\int_0^1 x(1-x)^n \ dx = \frac{1}{(n+2)(n+1)}$

4. The value of $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} (\frac{\sin x}{2+cosx})dx$ is

1) 0 2) 2 3) log 2 4) log 4

Hint : Since given function is odd

5. The value of $\int_0^{\pi} sin^4 x \, dx$ is

1) $3\pi/16$ 2) $3/16$ 3) 0 **4)** $\mathbf{3\pi/8}$

6. The value of $\int_0^{\pi} sin^2 x \, cos^3 x \, dx$ is

1) π 2) $\pi/2$ 3) $\pi/4$ **4) 0**

$$\int_0^{2a} f(x)dx = 0 \ , If \ (2a - x) = -f(x)$$

7. The area of the region bounded by the graph of $y = \sin x \ and \ y = \cos x$ between $x = 0$ and $x = \frac{\pi}{4}$ is

1) $\sqrt{2} + 1$ **2)** $\mathbf{\sqrt{2} - 1}$ 3) $2\sqrt{2} - 2$ 4) $2\sqrt{2} + 2$

8. The area between the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and its auxillary circle is

1) $\pi b(a - b)$ 2) $2\pi a(a - b)$ **3)** $\boldsymbol{\pi a(a - b)}$ 4) $2\pi b(a - b)$

Hint : Area of ellipse πab

Area of auxillary circle $x^2 + y^2 = a^2$

Area between the circle and the ellipse is $\pi a^2 - \pi ab$

9. The area bounded by the parabola $y^2 = x$ and its latus rectum is

1) $\frac{4}{3}$ **2)** $\mathbf{\frac{1}{6}}$ 3) $\frac{2}{3}$ 4) $\frac{8}{3}$

The area bounded by the parabola and its latus rectum is $\frac{8a^2}{3}$ Here a = ¼

10. The volume of the solid obtained by revolving $\frac{x^2}{9}+\frac{y^2}{16}=1$ about the minor axis is

1) 48π 2) 64π 3) 32π 4) 128 π

Hint : Volume about minor axis , V = $\frac{4}{3}\pi a^2 b$ Here $a^2 = 16$, $b^2 = 9$

11. The volume, when the curve $y = \sqrt{3+x^2}$ from $x = 0$ to $x = 4$ is rotated about x-axis is

1) 100 π 2) $\frac{100}{9}\pi$ **3)** $\boldsymbol{\frac{100}{3}\pi}$ 4) $\frac{100}{3}$

12. The volume generated when the region bounded by $y = x,\ y = 1, x = 0$ is rotated about y-axis is

1) $\frac{\pi}{4}$ 2) $\frac{\pi}{2}$ **3)** $\boldsymbol{\frac{\pi}{3}}$ 4) $\frac{2\pi}{3}$

Hint : Volume of cone V = $\frac{1}{3}\pi r^2 h$ = V $=\frac{1}{3}\pi(1)(1)=\frac{\pi}{3}$

13. Volume of solid obtained by revolving the area of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ about major and minor axes are in the ratio

1) $b^2 : a^2$ 2) $a^2 : b^2$ 3) $a : b$ **4)** $\boldsymbol{b : a}$

Volume about minor axis , V = $\frac{4}{3}\pi a^2 b$

Volume about major axis , V = $\frac{4}{3}\pi a b^2$

14. The volume generated by rotating the triangle with vertices at (0, 0), (3, 0) and (3, 3) about x-axis is

1) 18π 2) 2π 3) 36π **4) 9π**

Hint : Volume of cone V = $\frac{1}{3}\pi r^2 h$

15. $\int_0^{2a} f(x)dx = 2\int_0^a f(x)dx$ if ‘

1) $\boldsymbol{f(2a-x)=f(x)}$ 2) $f(a-x)=f(x)$

3) $f(x)=-f(x)$ 4) $f(-x)=f(x)$

16. $\int_0^{2a} f(x)dx = 0$ if

1) $f(2a-x)=f(x)$ **2)** $\boldsymbol{f(2a-x)=-f(x)}$

3) $f(x)=-f(x)$ 4) $f(-x)=f(x)$

17. If f (x) is an odd function then $\int_{-a}^{a} f(x)dx$ is

1) $2\int_0^a f(x)dx$ 2) $\int_0^a f(x)dx$ **3) 0** 4) $\int_0^a f(a-x)dx$

18. $\int_0^a f(x)dx + \int_0^a f(2a-x)dx =$

1) $\int_0^a f(x)dx$ 2) $2\int_0^a f(x)dx$ **3) $\int_0^{2a} f(x)dx$** 4) $\int_0^{2a} f(a-x)dx$

19. If f(x) is even then $\int_{-a}^a f(x)\,dx$ is

1) 0 **2) $2\int_0^a f(x)dx$** 3) $\int_0^a f(x)dx$ 4) $-2\int_0^a f(x)dx$

20. $\int_0^a f(x)dx$ is

1) $\int_0^a f(x-a)dx$ **2) $\int_0^a f(a-x)dx$** 3) $\int_0^a f(2a-x)dx$ 4) $\int_0^a f(x-2a)dx$

21. $\int_a^b f(x)dx$ is

1) $2\int_0^a f(x)dx$ 2) $\int_a^b f(a-x)dx$ 3) $\int_a^b f(b-x)dx$ **4) $\int_a^b f(a+b-x)dx$**

22. If n is a positive integer then $\int_0^\infty x^n e^{-ax}dx =$

1) $\frac{n!}{a^n}$ 2) $\frac{n+1!}{a^n}$ 3) $\frac{n+1!}{a^{n+1}}$ **4) $\frac{n!}{a^{n+1}}$**

23. If n is odd then $\int_0^{\pi/2} cos^n x\,dx$

1) $\frac{n}{n-1}.\frac{n-2}{n-3}.\frac{n-4}{n-5}\ldots\frac{\pi}{2}$ 2) $\frac{n-1}{n}.\frac{n-3}{n-2}.\frac{n-5}{n-4}\ldots\frac{1}{2}\frac{\pi}{2}$

3) $\frac{n}{n-1}.\frac{n-2}{n-3}.\frac{n-4}{n-5}\ldots\frac{3}{2}.1$ **4) $\frac{n-1}{n}.\frac{n-3}{n-2}.\frac{n-5}{n-4}\ldots\frac{2}{3}.1$**

24. If n is even then $\int_0^{\pi/2} sin^n x\,dx$ is

1) $\frac{n}{n-1}.\frac{n-2}{n-3}.\frac{n-4}{n-5}\ldots\frac{\pi}{2}$ **2) $\frac{n-1}{n}.\frac{n-3}{n-2}.\frac{n-5}{n-4}\ldots\frac{1}{2}\frac{\pi}{2}$**

3) $\frac{n}{n-1}.\frac{n-2}{n-3}.\frac{n-4}{n-5}\ldots\frac{3}{2}.1$ 4) $\frac{n-1}{n}.\frac{n-3}{n-2}.\frac{n-5}{n-4}\ldots\frac{2}{3}.1$

25. $\int_a^b f(x)dx =$

1) $-\int_a^b f(x)dx$ **2) $-\int_b^a f(x)dx$** 3) $-\int_b^a f(x)dx$ 4) $2\int_a^b f(x)dx$

26. The area bounded by the curve x = f (y), y-axis and the lines y = c and y = d is rotated about y-axis. Then the volume of the solid is

1) $\pi\int_c^d x^2dy$ 2) $\pi\int_c^d x^2dx$ 3) $\pi\int_c^d y^2dx$ 4) $\pi\int_c^d y^2dy$

27. $\int_0^\infty x^5e^{-4x}dx$ is

1) $\frac{6!}{4^6}$ 2) $\frac{6!}{4^5}$ **3) $\frac{5!}{4^6}$** 4) $\frac{5!}{4^5}$

28. $\int_0^\infty x^6 e^{-x/2}\, dx$

1) $\frac{6!}{2^7}$ 2) $\frac{6!}{2^6}$ 3) $2^6\ 6!$ **4) $2^7\ 6!$**

Chapter – 10 Ordinary Differential equation

1. The integrating factor of $\frac{dy}{dx} + 2\frac{y}{x} = e^{4x}$ is

1) $\log x$ **2) x^2** 3) e^x 4) x

Hint : $P = \frac{2}{x}\ \int pdx = 2logx = logx^2$

$e^{\int pdx} = x^2$

2. If $\cos x$ is an integrating factor of the differential equation $\frac{dy}{dx} + Py = Q$ then $P =$

1) $-\cot x$ 2) $\cot x$ 3) $\tan x$ **4) $-\tan x$**

Hint : $e^{\int pdx} = \cos x \implies \int pdx = \log\cos x$

3. The integrating factor of $dx + xdy = e^{-y}sec^2ydy$ is

1) e^x 2) e^{-x} **3) e^y** 4) e^{-y}

4. Integrating factor of $\frac{dy}{dx} + \frac{1}{x\log x}.y = \frac{2}{x^2}$ is

1) e^x **2) $\log x$** 3) $\frac{1}{x}$ 4) e^{-x}

5. Solution of $\frac{dy}{dx} + mx = 0$, where $m < 0$ is

1) $x = ce^{my}$ **2) $x = ce^{-my}$** 3) $x = my + c$ 4) $x = c$

6. $y = cx - c^2$ is the general solution of the differential equation

1) $(y')^2 - xy' + y = 0$ 2) $y'' = 0$

3) $y' = c$ 4) $(y')^2 + xy' + y = 0$

Hint : $y' = c$

$y = y'x - (y')^2$

7. The differential equation $\left(\frac{dx}{dy}\right)^2 + 5y^{1/3} = x$ is

1) of order 2 and degree 1 **2) of order 1 and degree 2**

3) of order 1 and degree 6 4) of order 1 and degree 3

8. The differential equation of all non-vertical lines in a plane is

1) $\frac{dy}{dx} = 0$ **2) $\frac{d^2y}{dx^2} = 0$** 3) $\frac{dy}{dx} = m$ 4) $\frac{d^2y}{dx^2} = m$

Non vertical lines $y = mx + c$

Hint : $y' = m : y'' = 0$

9. The differential equation of all circles with centre at the origin is

1) $x\,dy + y\,dx = 0$ 2) $x\,dy - y\,dx = 0$ 3) $x\,dx + y\,dy = 0$ 4) $x\,dx - y\,dy = 0$

$x^2 + y^2 = a^2$

10. The differential equation of the family of lines $y = mx$ is

1) $\frac{dy}{dx} = m$ **2) $ydx - xdy = 0$** 3) $\frac{d^2y}{dx^2} = 0$ 4) $ydx + x\,dy = 0$

11. The degree of the differential equation $\sqrt{1 + (\frac{dy}{dx})^{\frac{1}{3}}} = \frac{d^2y}{dx^2}$

1) 1 2) 2 3) 3 4) 6

To remove root , first square on both sides and after arranging , take cube on both sides to remove the radical $\frac{1}{3}$ so degree is 6

12. The differential equation satisfied by all the straight lines in xy plane is

1) $\frac{dy}{dx} = a\ constant$ **2) $\frac{d^2y}{dx^2} = 0$** 3) $y + \frac{dy}{dx} = 0$ 4) $\frac{d^2y}{dx^2} + y = 0$

Hint : $ax + by + c = 0$

$y'' = 0$

13. If $y = ke^{\lambda x}$ then its differential equation is

1) $\frac{dy}{dx} = \lambda y$ 2) $\frac{dy}{dx} = ky$ 3) $\frac{dy}{dx} + ky = 0$ 4) $\frac{dy}{dx} = e^{\lambda x}$

14. The differential equation obtained by eliminating a and b from $y = ae^{3x} + be^{-3x}$ is

1) $\frac{d^2y}{dx^2} + ay = 0$ **2) $\frac{d^2y}{dx^2} - 9y = 0$** 3) $\frac{d^2y}{dx^2} - 9\frac{dy}{dx} = 0$ 4) $\frac{d^2y}{dx^2} + 9x = 0$

15. The differential equation formed by eliminating A and B from the relation $y = e^x(A\cos x + B\sin x)$ is

1) $y_2 + y_1 = 0$ 2) $y_2 - y_1 = 0$

3) $y_2 - 2y_1 + 2y = 0$ 4) $y_2 - 2y_1 - 2y = 0$

16. If $\frac{dy}{dx} = \frac{x-y}{x+y}$ then

1) $2xy + y^2 + x^2 = c$ 2) $x^2 + y^2 - x + y = c$

3) $x^2 + y^2 - 2xy = c$ **4) $x^2 - y^2 - 2xy = c$**

Hint : $(x + y)dy = (x - y)dx$

$(xdy + ydx) + ydy - xdx = 0$

$d(xy) + ydy - xdx = 0$

17. If $f'(x)=\sqrt{x}$ and $f(1) = 2$ then $f(x)$ is

1) $-\frac{2}{3}(x\sqrt{x}+2)$ 2) $\frac{3}{2}(x\sqrt{x}+2)$ **3) $\frac{2}{3}(x\sqrt{x}+2)$** 4) $\frac{2}{3}x(\sqrt{x}+2)$

$f(x) = \frac{x^{3/2}}{\frac{3}{2}} + c$

18. On putting $y = vx$, the homogeneous differential equation $x^2dy + y(x+y)dx = 0$ becomes

1) $xdv + (2v+v^2)dx = 0$ 2) $vdx + (2x+x^2)dv = 0$

3) $v^2dx - (x+x^2)dv = 0$ 4) $vdv + (2x+x^2)dx = 0$

19. The integrating factor of the differential equation $\frac{dy}{dx} - y\tan x = \cos x$ is

1) $\sec x$ **2) $\cos x$** 3) $e^{\tan x}$ 4) $\cot x$

$p = -\tan x$

$e^{\int pdx} = e^{\log \cos x} = \cos x$

20. The order and degree of the differential equation are $y' + y^2 = x$

1) 2,1 **2) 1,1** 3) 1,0 4) 0,1

21. The order and degree of the differential equation are $\frac{d^2y}{dx^2} + x = \sqrt{y + \frac{dy}{dx}}$

1) 2,1 2) 1,2 3) 2,1/2 **4) 2,2**

22. The order and degree of the differential equation are $\frac{d^2y}{dx^2} - y + (\frac{dy}{dx} + \frac{d^3y}{dx^3})^{\frac{3}{2}} = 0$

1) 2,3 **2) 3,3** 3) 3,2 4) 2,2

23. The order and degree of the differential are $\sin x(dx+dy) = \cos\, x(dx-dy)$

1) 1,1 2) 0,0 3) 1,2 4) 2,1

24. The solution of a linear differential equation $\frac{dx}{dy} + Px = Q$ where P and Q are functions of y, is

1) $y(I.F) = \int(I.F)Q\,dx + c$ **2) $x(I.F) = \int(I.F)Q\,dy + c$**

3) $y(I.F) = \int(I.F)Q\,dy + c$ 4) $x(I.F) = \int(I.F)Q\,dx + c$

25. The solution of a linear differential equation $\frac{dy}{dx} + Py = Q$ where P and Q are functions of x, is

1) $y(I.F) = \int(I.F)Q\,dx + c$ 2) $x(I.F) = \int(I.F)Q\,dy + c$

3) $y(I.F) = \int (I.F)Q\, dy + c$ 4) $x(I.F) = \int (I.F)Q\, dx + c$

26. Identify the incorrect statement
1) The order of a differential equation is the order of the highest derivative occurring in it.
2) The degree of the differential equation is the degree of the highest order derivative which occurs in it (the derivatives are free from radicals and fractions)
3) $\frac{dy}{dx} = \frac{f_1(x,y)}{f_2(x,y)}$ is the first order first degree homogeneous differential equation
4) $\frac{dy}{dx} + xy = e^x$ is a linear differential equation in x.

Chapter – 11 Probability Distributions

1. If $f(x) = \begin{cases} kx^2 & ,0 < x < 3 \\ 0, & elsewhere \end{cases}$ is a probability density function then the value of k is
1) $\frac{1}{3}$ 2) $\frac{1}{6}$ **3) $\frac{1}{9}$** 4) $\frac{1}{12}$
Hint : $\int_0^3 kx^2 dx = 1 \Longrightarrow k\left[\frac{x^3}{3}\right]_0^3 = \frac{1}{9}$

2. If $f(x) = \frac{A}{\pi}\frac{1}{16+x^2}$, $-\infty < x < \infty$ Is a p.d.f of a continuous random variable X, then the value of A is
1) 16 2) 8 **3) 4** 4) 1
Hint : $\frac{A}{\pi}\int_{-\infty}^{\infty} \frac{1}{16+x^2} dx = 1$

3. X is a discrete random variable which takes the values 0, 1, 2 and $P(X = 0) = \frac{144}{169}$, $P(X = 1) = \frac{1}{169}$ then the value of $P(X = 2]$ is
1) $\frac{145}{169}$ 2) $\frac{24}{169}$ 3) $\frac{2}{169}$ 4) $\frac{143}{169}$
Hint : $P(X = 2] = 1 – (P(X = 0] + P(X = 1]$

4. A random variable X has the following p.d.f

X	0	1	2	3	4	5	6	7
$P(X = x)$	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2 + k$

The value of k is
1) $\frac{1}{8}$ **2) $\frac{1}{10}$** 3) 0 4) $-1\ or \frac{1}{10}$
Hint : $k + 2k + 2k + 3k + k^2 + 2k^2 + 7k^2 + k = 1$
$k = \frac{1}{10}\ or -1$ But k is non negative

5. X is a random variable taking the values 3, 4 and 12 with probabilities $\frac{1}{3}, \frac{1}{4}$ *and* $\frac{5}{12}$. Then $E(X)$ is

1) 5 **2) 7** 3) 6 4) 3

6. Variance of the random variable X is 4. Its mean is 2. Then $E(X^2)$ is

1) 2 2) 4 3) 6 **4) 8**

Hint : Var $(X) = E(X^2) - E(X)^2$

$E(X)^2 = 8$

7. Var $(4X + 3)$ is

1) 7 **2) 16 Var (X)** 3) 19 4) 0

Hint : Var $(4X + 3) = a^2 Var(X) = 16\, Var\,(X)$

8. In 5 throws of a die, getting 1 or 2 is a success. The mean number of successes is

1) $\frac{5}{3}$ 2) $\frac{3}{5}$ 3) $\frac{5}{9}$ 4) $\frac{9}{5}$

Hint : Mean = np ; n = 5 . p = $\frac{1}{3}$: mean np = $\frac{5}{3}$

9. The mean of a binomial distribution is 5 and its standard deviation is 2. Then the value of n and p are

1) $\left(\frac{4}{5}, 25\right)$ 2) $\left(25, \frac{4}{5}\right)$ 3) $\left(\frac{1}{5}, 25\right)$ 4) $\left(25, \frac{1}{5}\right)$

Hint : $np = 5$; $\sqrt{npq} = 2 \rightarrow npq = 4$

Solving $q = \frac{4}{5}, p = \frac{1}{5}, n = 25$

$(n, p) = \left(25, \frac{1}{5}\right)$

10. If the mean and standard deviation of a binomial distribution are 12 and 2 respectively. Then the value of its parameter p is

1) $\frac{1}{2}$ 2) $\frac{1}{3}$ **3) $\frac{2}{3}$** 4) $\frac{1}{4}$

11. In 16 throws of a die getting an even number is considered a success. Then the variance of the successes is

1) 4 2) 6 3) 2 4) 256

Hint : $p = \frac{1}{2}; q = \frac{1}{2}$

$variance = npq = 4$

12. A box contains 6 red and 4 white balls. If 3 balls are drawn at random, the probability of getting 2 white balls without replacement, is

1) $\frac{1}{20}$ 2) $\frac{18}{125}$ 3) $\frac{4}{25}$ **4) $\frac{3}{10}$**

13. If 2 cards are drawn from a well shuffled pack of 52 cards, the probability that they are of the same colours without replacement, is
1) $\frac{1}{2}$ 2) $\frac{26}{51}$ **3)** $\mathbf{\frac{25}{51}}$ 4) $\frac{25}{102}$

14. A discrete random variable takes
1) only a finite number of values **2) all possible values between certain given limits**
3) infinite number of values 4) a finite or countable number of values

15. A continuous random variable takes
1) only a finite number of values 2) all possible values between certain given limits
3) infinite number of values 4) a finite or countable number of values

16. If X is a discrete random variable then $P(X \geq a) =$
1) $P(X < a)$ 2) $1 - p(X \leq a)$ **3)** $\mathbf{1 - P(X < a)}$ 4) 0

17. If X is a continuous random variable then $P(X \geq a) =$
1) $P(X < a)$ 2) $1 - P(X < a)$ 3) $P(X > a)$ **4)** $\mathbf{1 - p(X \leq a - 1)}$

18. If X is a continuous random variable then $P(a < X < b) =$
1) $P(a \leq X \leq b)$ **2)** $\mathbf{P(a < X \leq b)}$ 3) $P(a \leq X < b)$ 4) all the three above

19. A continuous random variable X has p.d.f . f(x) then
1) $\mathbf{0 \leq f(x) \leq 1}$ 2) $f(x) \geq 0$ 3) $f(x) \leq 1$ 4) $0 < f(x) < 1$

20. A discrete random variable X has probability, mass function p(x), then
1) $0 \leq p(x) \leq 1$ 2) $p(x) \geq 0$ 3) $p(x) \leq 1$ **4)** $\mathbf{0 < p(x) < 1}$

21. Mean and variance of binomial distribution are
1) nq, npq 2) np,$\sqrt{npq}$ 3)) np, np 4) np, npq

22. If X is a discrete random variable then which of the following is correct?
1) $0 \leq F(x) < 1$ 2) $F(-\infty) = 0 \;\; and \;\; F(\infty) \leq 1$
3) $\mathbf{P[X = x_n] = F(x_n) - F(x_n - 1)}$ 4) F(x) is a constant function

23. If X is a continuous random variable then which of the following is incorrect?
1) $F'(\mathrm{x}) = f(\mathrm{x})$ 2) $F(\infty) = 1\,, F(-\infty) = 0$
3) $P[a \leq \mathrm{x} \leq b] = F(b) - F(a)$ **4)** $P[a \leq \mathrm{x} \leq b] \neq F(b) - F(a)$

24. Which of the following are correct?
i) $E(aX + b) = aE(X) + b$ ii) $\mu_2 = \mu_2' - (\mu_1')^2$

iii) μ_2 =variance iv) var $(aX + b) = a^2\ var(X)$

1) all 2) (i) , (ii) , (iii) 3) (ii) , (iii) **4) (i) , (iv)**

Chapter – 12 Discrete Mathematics

1. Which of the following are statements?

(i) May God bless you. (ii) Rose is a flower (iii) Milk is white. (iv) 1 is a prime number

1) (i), (ii), (iii) 2) (i), (ii), (iv) 3) (i), (iii), (iv) **4) (ii), (iii), (iv)**

2. If a compound statement is made up of three simple statements, then the number of rows in the truth table is

1) 8 2) 6 3) 4 4) 2

Hint : Number of rows = 2^n Here n = 3

3. If p is T and q is F, then which of the following have the truth value T?

(i) $p \vee q$ (ii) $\sim p \vee q$ (iii) $p \vee \sim q$ (iv) $p \wedge \sim q$

1) (i), (ii), (iii) 2) (i), (ii), (iv) **3) (i), (iii), (iv)** 4) (ii), (iii), (iv)

4. The number of rows in the truth table of $\sim [p \wedge (\sim q)]$ is

1) 2 **2) 4** 3) 6 4) 8

Hint : Here n = 2 : $2^2 = 4$

5. The conditional statement $p \to q$ is equivalent to

1) $p \vee q$ 2) $p \vee \sim q$ **3) $\sim p \vee q$** 4) $p \wedge q$

6. Which of the following is a tautology?

1) $p \vee q$ 2) $p \wedge q$ **3) $p \vee \sim p$** 4) $p \wedge \sim p$

7. Which of the following is a contradiction?

1) $p \vee q$ 2) $p \wedge q$ 3) $p \vee \sim p$ **4) $p \wedge \sim p$**

8. $p \leftrightarrow q$ is equivalent to

1) $p \to q$ 2) $q \to p$ 3) $(p \to q) \vee (q \to p)$ **4) $(p \to q) \wedge (q \to p)$**

10. In the set of integers with operation $*$ defined by $a * b = a + b - ab$, the value of $3 * (4 * 5)$ is

1) 25 2) 15 3) 10 4) 5

Hint : $3 * (4 * 5) = 3 * (4 + 5 - 20) = 3 * (-11) = 25$

11. The value of $[3] +_{11} ([5] +_{11} [6])$ is

1) [0] 2) [1] 3) [2] **4) [3]**

12. In the set of real numbers R, an operation * is defined by $a * b = \sqrt{a^2 + b^2}$. Then the value of $(3 * 4) * 5$ is

1) 5 **2) $5\sqrt{2}$** 3) 25 4) 50

13. $[3]+_8[7]$ is

1) [10] 2) [8] 3) [5] **4) [2]**

14. In the set of integers under the operation $*$ defined by $a * b = a + b - 1$, the identity element is

1) 0 **2) 1** 3) a 4) b

Hint : $a * e = 1$

$a * e = a + e - 1$

$e = 1$

15. Which of the following are statements ?

i.Chennai is the capital of Tamil Nadu. ii.The earth is a planet.

iii.Rose is a flower iv.Every triangle is an isosceles triangle

1) all 2) (i) and (ii) 3) (ii) and (iii) 4) (iv) only

16. Which of the following are not statements ?

i. Three plus four is eight ii. The sun is a planet

iii. Switch on the light iv. Where are you going ?

1) (i) and (ii) 2) (ii) and (iii) **3) (iii) and (iv)** 4) (iv) only

17. The truth values of the following statements are

i. Ooty is in Tamilnadu and 3 + 4 = 8 ii. Ooty is in Tamilnadu and 3 + 4 = 7

iii. Ooty is in Kerala and 3 + 4 = 7 iv. Ooty is in Kerala and 3 + 4 = 8

1) F,T,F,F 2) F,F,F,T 3) T,T,F,F 4) T,F,T,F

18. The truth values of the following statements are

i) Chennai is in India or $\sqrt{2}$ is an integer. ii) Chennai is in India or $\sqrt{2}$ is an irrational number

iii) Chennai is in China or $\sqrt{2}$ is an integer iv) Chennai is in China or $\sqrt{2}$ is an irrational number

1) T F T F 2) T F F T 3) F T F T **4) T T F T**

19. Which of the following are not statements ?

i. All natural numbers are integers. ii. A square has five sides

iii. The sky is blue iv. How are you ?

1) (iv) only 2) (i) and (ii) 3) (i) (ii) and (iii) 4) (iii) and (iv)

20. Which of the following are statements?

i. 7 + 2 < 10 ii. The set of rational numbers is finite

iii. How beautiful you are iv. Wish you all success.

1) (iii) (iv) **2) (i) , (ii)** 3) (i) , (iii) 4) (ii) , (iv)

21. The truth values of the following statements are

i. All the sides of a rhombus are equal in length ii. $1+\sqrt{19}$ is an irrational number

iii. Milk is white iv. The number 30 has four prime factors.

1) T T T F 2) T T T T 3) T F T F 4) F T T T

22. The truth values of the following statements are

i) Paris is in France ii) sinx is an even function

iii) Every square matrix is non-singular iv) Jupiter is a planet

1) T F F T 2) F T F T 3) F T T F 4) F F T T

23. Let p be " Kamala is going to school " and q be " There are twenty students in the class ". " Kamala is not going to school or there are twenty students in the class " stands for

1) $p \vee q$ 2) $p \wedge q$ 3) $\sim p$ **4) $\sim p \vee q$**

24. If p stands for the statement " Sita likes reading " and q for the statement " Sita likes playing ". " Sita likes neither reading not playing " stands for

1) $\sim p \wedge \sim q$ 2) $p \wedge \sim q$ 3) $\sim p \wedge q$ 4) $p \wedge q$

25. If p is true and q is unknown then

1) $\sim p$ is true 2) $p \vee (\sim p)$ is false 3) $p \wedge (\sim p)$ is true **4) $p \vee q$ is true**

26. If p is true and q is false then which of the following statements is not true ?

1) $p \to q$ is false 2) $p \vee q$ is true 3) $p \wedge q$ is false **4) $p \leftrightarrow q$ is true**

27. Which of the following is not true?

1) Negation of a negation of a statement is the statement itself

2) If the last column of its truth table contain only T then it is tautology

3) If the last column of its truth table contains only F then it is contradiction

4) If p and q are any two statements then $p \leftrightarrow q$ is a tautology

28. $'+'$ is not a binary operation on

1) N 2) Z 3) C **4) $Q-\{0\}$**

29. $'-'$ is a binary operation on

1) N 2) $Q-\{0\}$ 3) $R-\{0\}$ **4) Z**

30. $'\div'$ is a binary operation on

1) N 2) R 3) Z **4) $C-\{0\}$**