+2 MATHS BOOK BACK ONE MARKS

WITH ANSWERS AND IMPORTANT WORD BLACKENED

Chapter – 1 Application Of Matrices And Determinants

1. If $|\boldsymbol{adj}(\boldsymbol{adj}\ \boldsymbol{A})| = |\boldsymbol{A}|^9$, then the **order of the square matrix A** is

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

2. If A is a **3 × 3 non-singular matrix** such that $AA^T = A^T A$ and $= A^{-1}A^T$, then $\boldsymbol{BB^T} =$

1) A 2) B **3) $\boldsymbol{I}$** 4) B^T

3. If **A**=$\begin{bmatrix} \mathbf{3} & \mathbf{5} \\ \mathbf{1} & \mathbf{2} \end{bmatrix}$, B = adj A and C = 3A, then $\frac{|\boldsymbol{adj}\ \boldsymbol{B}|}{|\boldsymbol{C}|} =$

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

4. If **A**$\begin{bmatrix} \mathbf{1} & \mathbf{-2} \\ \mathbf{1} & \mathbf{4} \end{bmatrix} = \begin{bmatrix} \mathbf{6} & \mathbf{0} \\ \mathbf{0} & \mathbf{6} \end{bmatrix}$, then A=

1) $\begin{bmatrix} 1 & -2 \\ 1 & 4 \end{bmatrix}$ 2) $\begin{bmatrix} 1 & 2 \\ -1 & 4 \end{bmatrix}$ 3) $\begin{bmatrix} 4 & 2 \\ -1 & 1 \end{bmatrix}$ **4) $\begin{bmatrix} \mathbf{4} & \mathbf{-1} \\ \mathbf{2} & \mathbf{1} \end{bmatrix}$**

5. If A=$\begin{bmatrix} \mathbf{7} & \mathbf{3} \\ \mathbf{4} & \mathbf{2} \end{bmatrix}$, then **9*I* –*A***=

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

6. If $A = \begin{bmatrix} \mathbf{2} & \mathbf{0} \\ \mathbf{1} & \mathbf{5} \end{bmatrix}$ **and** $B = \begin{bmatrix} \mathbf{1} & \mathbf{4} \\ \mathbf{2} & \mathbf{0} \end{bmatrix}$ then **/adj(*AB*)**| =

1) -40 **2) -80** 3) -60 4) -20

7. If $\boldsymbol{P} = \begin{bmatrix} \mathbf{1} & \boldsymbol{x} & \mathbf{0} \\ \mathbf{1} & \mathbf{3} & \mathbf{0} \\ \mathbf{2} & \mathbf{4} & \mathbf{-2} \end{bmatrix}$ is the adjoint of 3×3 matrix A and $|\boldsymbol{A}| = \mathbf{4}$, then x is

1) 15 2) 12 3) 14 **4) 11**

8. If $\boldsymbol{A} = \begin{bmatrix} \mathbf{3} & \mathbf{1} & \mathbf{-1} \\ \mathbf{2} & \mathbf{-2} & \mathbf{0} \\ \mathbf{1} & \mathbf{2} & \mathbf{-1} \end{bmatrix}$ and $\boldsymbol{A^{-1}} = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$ then the value of $\boldsymbol{a_{23}}$ is

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

9. If **A, B and C are invertible matrices** of some order, then which one of the following is **not true**?

1) $adj\ A=|A|\ A^{-1}$ **2) $adj(AB)=(adj\ A)(adj\ B)$**

3) $det\ A^{-1} = (det\ A)^{-1}$ 4) $(ABC)^{-1} = C^{-1}B^{-1}A^{-1}$

10. If $(AB)^{-1}=\begin{bmatrix} 12 & -17 \\ -19 & 27 \end{bmatrix}$ and $A^{-1}=\begin{bmatrix} 1 & -1 \\ -2 & 3 \end{bmatrix}$, then B^{-1} =

1) $\begin{bmatrix} 2 & -5 \\ -3 & 8 \end{bmatrix}$ 2) $\begin{bmatrix} 8 & 5 \\ 3 & 2 \end{bmatrix}$ 3) $\begin{bmatrix} 3 & 1 \\ 2 & 1 \end{bmatrix}$ 4) $\begin{bmatrix} 8 & -5 \\ -3 & 2 \end{bmatrix}$

11. If A^TA^{-1} **is symmetric**, then A^2 =

1) A^{-1} **2) $(A^T)^2$** 3) A^T 4) $(A^{-1})^2$

12. If A is an **non-singular matrix** such that $A^{-1}=\begin{bmatrix} 5 & 3 \\ -2 & -1 \end{bmatrix}$, then $(A^T)^{-1}$=

1) $\begin{bmatrix} -5 & 3 \\ 2 & 1 \end{bmatrix}$ 2) $\begin{bmatrix} 5 & 3 \\ -2 & -1 \end{bmatrix}$ 3) $\begin{bmatrix} -1 & -3 \\ 2 & 5 \end{bmatrix}$ **4)** $\begin{bmatrix} 5 & -2 \\ 3 & -1 \end{bmatrix}$

13. If $A = \begin{bmatrix} \frac{3}{5} & \frac{4}{5} \\ x & \frac{3}{5} \end{bmatrix}$ and $A^T=A^{-1}$, then the value of x is

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

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

1) $\left(\cos^2\frac{\theta}{2}\right)A$ **2)** $\left(\cos^2\frac{\theta}{2}\right)A^T$ 3) $(\cos^2\theta)I$ 4) $\left(\sin^2\frac{\theta}{2}\right)A$

15. If $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ and $A(adj\ A) = \begin{bmatrix} k & 0 \\ 0 & k \end{bmatrix}$, then k =

1) 0 2) $\sin\theta$ 3) $\cos\theta$ **4) 1**

16. If $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$ be such that $\lambda A^{-1} = A$, then λ is

1) 17 2) 14 **3) 19** 4) 21

17. If **adj**$A=\begin{bmatrix}\mathbf{2} & \mathbf{3}\\ \mathbf{4} & \mathbf{-1}\end{bmatrix}$ and **adj**$B=\begin{bmatrix}\mathbf{1} & \mathbf{-2}\\ \mathbf{-3} & \mathbf{1}\end{bmatrix}$ then **adj** ***(AB)***is

1) $\begin{bmatrix}-7 & -1\\ 7 & -9\end{bmatrix}$ **2)**$\begin{bmatrix}\mathbf{-6} & \mathbf{5}\\ \mathbf{-2} & \mathbf{-10}\end{bmatrix}$ 3)$\begin{bmatrix}-7 & 7\\ -1 & -9\end{bmatrix}$ 4)$\begin{bmatrix}-6 & -2\\ 5 & -10\end{bmatrix}$

18. The **rank** of the matrix $\begin{bmatrix}\mathbf{1} & \mathbf{2} & \mathbf{3} & \mathbf{4}\\ \mathbf{2} & \mathbf{4} & \mathbf{6} & \mathbf{8}\\ \mathbf{-1} & \mathbf{-2} & \mathbf{-3} & \mathbf{-4}\end{bmatrix}$ is

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

19. If $\boldsymbol{x^a y^b = e^m, x^c y^d = e^n, \Delta_1 = \begin{vmatrix}m & b\\ n & d\end{vmatrix}, \Delta_2 = \begin{vmatrix}a & m\\ c & n\end{vmatrix}, \Delta_3 = \begin{vmatrix}a & b\\ c & d\end{vmatrix}}$, then the values of x and y are respectively,

1) $e^{\left(\Delta_2/\Delta_1\right)}, e^{\left(\Delta_3/\Delta_1\right)}$ 2) $log\left(\Delta_1/\Delta_3\right), log\left(\Delta_2/\Delta_3\right)$

3) $log\left(\Delta_2/\Delta_1\right), log\left(\Delta_3/\Delta_1\right)$ **4)** $\boldsymbol{e^{\left(\Delta_1/\Delta_3\right)}, e^{\left(\Delta_2/\Delta_3\right)}}$

20. Which of the following is/are **correct**?

(i) Adjoint of a symmetric matrix is also a symmetric matrix.

(ii) Adjoint of a diagonal matrix is also a diagonal matrix.

(iii) If A is a square matrix of order n and λ is a scalar, then $adj(\lambda A) = \lambda^n adj(A)$.

(iv) $A(adj\ A) = (adj\ A)A = |A|I$

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

21. If $\boldsymbol{\rho(A) = \rho}$**([A|B]),** then the system **AX = B** of linear equations is

1) consistent and has a unique solution **2) consistent**

3) consistent and has infinitely many solution 4) inconsistent

22. If $\boldsymbol{0 \le \theta \le \pi}$ and the system of equation $\boldsymbol{x + (sin\theta)y - (cos\theta)z = 0, (cos\theta)x - y + z = 0, (sin\theta)x + y - z = 0}$ has a **non-trivial solution** then θ is

1)$\frac{2\pi}{3}$ 2) $\frac{3\pi}{4}$ 3) $\frac{5\pi}{6}$ **4)** $\boldsymbol{\frac{\pi}{4}}$

23. The augmented matrix of a system of linear equation is $\begin{bmatrix}\mathbf{1} & \mathbf{2} & \mathbf{7} & \mathbf{3}\\ \mathbf{0} & \mathbf{1} & \mathbf{4} & \mathbf{6}\\ \mathbf{0} & \mathbf{0} & \boldsymbol{\lambda - 7\mu + 5} & \end{bmatrix}$. The system has **infinitely many solutions** if

1) $\lambda = 7, \mu \neq -5$ 2) $\lambda = -7, \mu = 5$ 3) $\lambda \neq 7, \mu \neq -5$ **4)** $\boldsymbol{\lambda = 7, \mu = -5}$

24. Let $\boldsymbol{A}=\begin{bmatrix} \mathbf{2} & \mathbf{-1} & \mathbf{1} \\ \mathbf{-1} & \mathbf{2} & \mathbf{-1} \\ \mathbf{1} & \mathbf{-1} & \mathbf{2} \end{bmatrix}$ $and\ \mathbf{4}\boldsymbol{B}=\begin{bmatrix} \mathbf{3} & \mathbf{1} & \mathbf{-1} \\ \mathbf{1} & \mathbf{3} & \boldsymbol{x} \\ \mathbf{-1} & \mathbf{1} & \mathbf{3} \end{bmatrix}$. IfB is the inverse of A, then value of x is

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

25. If $A=\begin{bmatrix} \mathbf{3} & \mathbf{-3} & \mathbf{4} \\ \mathbf{2} & \mathbf{-3} & \mathbf{4} \\ \mathbf{0} & \mathbf{-1} & \mathbf{1} \end{bmatrix}$, then **adj(adj A)** is

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

Chapter – 2 Complex Numbers

1. $\boldsymbol{i^n+i^{n+1}+i^{n+2}+i^{n+3}}$ is

1) 0 2) 1 3) -1 4) i

2. The value of $\sum_{i=1}^{13}(\boldsymbol{i^n+i^{n-1}})$ is

1) $\boldsymbol{i^{n+1}}$ 2) i 3) 1 4) 0

3. The **area of the triangle** formed by the complex numbers **z, iz, and z+iz** in the Argand's diagram is

1) $\frac{\mathbf{1}}{\mathbf{2}}|\boldsymbol{z}|^{\mathbf{2}}$ 2)$|z|^2$ 3)$\frac{3}{2}|z|^2$ 4) $2|z|^2$

4. The **conjugate** of a complex number is $\frac{\mathbf{1}}{\boldsymbol{i-2}}$. Then, **the complex number** is

1)$\frac{1}{i+2}$ **2)**$\frac{\mathbf{-1}}{\boldsymbol{i+2}}$ 3)$\frac{-1}{i-2}$ 4)$\frac{1}{i-2}$

5. If $\boldsymbol{z}=\frac{(\sqrt{\mathbf{3}}+\boldsymbol{i})^{\mathbf{3}}(\mathbf{3}\boldsymbol{i}+\mathbf{4})^{\mathbf{2}}}{(\mathbf{8}+\mathbf{6}\boldsymbol{i})^{\mathbf{2}}}$, then $|\boldsymbol{z}|$ is equal to

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

6. If z is a non zero complex number, such that $\mathbf{2}\boldsymbol{iz}^{\mathbf{2}}=\bar{\boldsymbol{z}}$ then $|\boldsymbol{z}|$ is

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

7. If $|\boldsymbol{z}-\mathbf{2}+\boldsymbol{i}|\leq\mathbf{2}$, then the **greatest value of** $|\boldsymbol{z}|$ is

1)$\sqrt{3}-2$ 2)$\sqrt{3}+2$ 3)$\sqrt{5}-2$ **4)**$\sqrt{\mathbf{5}}+\mathbf{2}$

8. If $\left|\boldsymbol{z}-\frac{\mathbf{3}}{\boldsymbol{z}}\right|=\mathbf{2}$, then the **least value of** $|\boldsymbol{z}|$ is

1) 1 2) 2 3) 3 4) 5

9. If $|z| = 1$, then the value of $\frac{1+z}{1+\bar{z}}$ is

1) z 2) $\bar{z}$ 3) $\frac{1}{z}$ 4) 1

10. The solution of the equation $|z| - z = 1 + 2i$ is

1) $\frac{3}{2} - 2i$ 2) $-\frac{3}{2} + 2i$ 3) $2 - \frac{3}{2}i$ 4) $2 + \frac{3}{2}i$

11. If $|z_1| = 1, |z_2| = 2, |z_3| = 3$ *and* $|9z_1z_2 + 4z_1z_3 + z_2z_3| = 12$, then the value of $|z_1 + z_2 + z_3|$ is

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

12. If z is a complex number such that $z \in C\backslash R$ and $z + \frac{1}{z} \in R$, then $|z|$ is

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

13. If z_1, z_2 *and* z_3 are complex numbers such that $z_1 + z_2 + z_3 = 0$ and $|z_1| = |z_2| = |z_3| = 1$ then $z_1^2 + z_2^2 + z_3^2$ is

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

14. If $\frac{z-1}{z+1}$ is purely **imaginary**, then $|z|$ is

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

15. If $z = x + iy$ is a complex number such that $|z + 2| = |z - 2|$, then the **locus of z** is

1) real axis **2) imaginary axis** 3) ellipse 4) circle

16. The principal **argument of** $\frac{3}{-1+i}$ is

1) $\frac{-5\pi}{6}$ 2) $\frac{-2\pi}{3}$ **3) $\frac{-3\pi}{4}$** 4) $\frac{-\pi}{2}$

17. The principal **argument of** $(\sin 40° + i\cos 40°)^5$ is

1) $-110°$ 2) $-70°$ 3) $70°$ 4) $110°$

18. If $(1 + i)(1 + 2i)(1 + 3i) \ldots\ldots (1 + ni) = x + iy$, then **2.5.10…(1+$n^2$)** is

1) 1 2) i **3) $x^2 + y^2$** 4) $1 + n^2$

19. If $\omega \neq 1$ is a **cubic root of unity and (1+ω)^7 =$A + B\omega$**, then **(A,B)** equals

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

20. The principal **argument** of the complex number $\frac{(1+i\sqrt{3})^2}{4i(1-i\sqrt{3})}$ is

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

21. If α *and* β are the roots of $x^2 + x + 1 = 0$, then $\alpha^{2020} + \beta^{2020}$ is

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

22. The **product** of all **four values** of $(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3})^{\frac{3}{4}}$ is

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

23. If $\omega \neq 1$ is a cubic root of unity and $\begin{vmatrix} 1 & 1 & 1 \\ 1 & -\omega^2 - 1 & \omega^2 \\ 1 & \omega^2 & \omega^7 \end{vmatrix} = 3k$, then k is equal to

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

24. The value of $\left(\frac{1+\sqrt{3}i}{1-\sqrt{3}i}\right)^{10}$ is

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

25. If $\omega = cis\frac{2\pi}{3}$, then the number of distinct roots of $\begin{vmatrix} z+1 & \omega & \omega^2 \\ \omega & z+\omega^2 & 1 \\ \omega^2 & 1 & z+\omega \end{vmatrix} = 0$

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

Chapter – 3 Theory of Equation

1. A **zero of $x^3 + 64$** is

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

2. If f and g are polynomials of degrees m and n respectively, and if $h(x)=(f \circ g)(x)$, then the **degree of h** is

1) mn 2) $m+n$ 3) m^n 4) n^m

3. A **polynomial equation** in x **of degree n** always has

1) n distinct roots 2) n real roots **3) Exactly n roots** 4)Atmost one root

4. If $\alpha, \beta, and\ \gamma$ are the roots of $x^3 + px^2 + qx + r$, then $\sum\frac{1}{\alpha}$ is

1) $-\frac{q}{r}$ 2) $-\frac{p}{r}$ 3) $\frac{q}{r}$ 4) $-\frac{q}{p}$

5. According to the rational root theorem, which number is **not possible rational root** of $4x^7 + 2x^4 - 10x^3 - 5$?

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

6. The polynomial $x^3 - kx^2 + 9x$ has **three real roots** if and only if, k satisfies

1) $|k| \leq 6$ 2) $k = 0$ 3) $|k| > 6$ **4) $|k| \geq 6$**

7. The **number of real numbers** in $[\mathbf{0,2\pi}]$ satisfying $\boldsymbol{sin^4x - 2sin^2x + 1}$ is

1) 2 2) 4 3) 1 4) ∞

8. If $\boldsymbol{x^3 + 12x^2 + 10ax + 1999}$ definitely has a **positive root,** if and only if

1) $a \geq 0$ 2) $a > 0$ **3)** $\boldsymbol{a < 0}$ 4) $a \leq 0$

9. The polynomial $x^3 + 2x + 3$ has

1) one negative and two real roots 2) one positive and two imaginary roots

3) three real roots 4) no solution

10. The **number of positive roots** of the polynomial $\boldsymbol{\sum_{j=0}^{n} nC_r\,(-1)^r x^r}$ is

1) 0 **2)** $\boldsymbol{n}$ 3) $<n$ 4) r

Chapter – 4 Trigonometric Functions

1. The value of $\boldsymbol{sin^{-1}(\cos x), 0 \leq x \leq \pi}$is

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

2. If $\boldsymbol{sin^{-1}x + sin^{-1}y = \frac{2\pi}{3}}$; then $\boldsymbol{cos^{-1}x + cos^{-1}y}$ is equal to

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

3. $\boldsymbol{sin^{-1}\frac{3}{5} - cos^{-1}\frac{12}{13} + sec^{-1}\frac{5}{3} - cosec^{-1}\frac{13}{12}}$ is equal to

1) 2π 2) π **3) 0** 4) $tan^{-1}\frac{12}{65}$

4.If $\boldsymbol{sin^{-1}x = 2sin^{-1}\alpha}$ has a solution, then

1) $\boldsymbol{|\alpha| \leq \frac{1}{\sqrt{2}}}$ 2) $|\alpha| \geq \frac{1}{\sqrt{2}}$ 3) $|\alpha| < \frac{1}{\sqrt{2}}$ 4)$|\alpha| > \frac{1}{\sqrt{2}}$

5. $\boldsymbol{sin^{-1}(\cos x) = \frac{\pi}{2} - x}$ is valid for

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

6. If $\boldsymbol{sin^{-1}x + sin^{-1}y + sin^{-1}z = \frac{3\pi}{2}}$, the value of $\boldsymbol{x^{2017} + y^{2018} + z^{2019} - \frac{9}{x^{101}+y^{101}+z^{101}}}$is

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

7. **If** $\boldsymbol{cot^{-1}x = \frac{2\pi}{5}}$ for some $x \in R$, the value of $\boldsymbol{tan^{-1}x}$ is

1) $-\frac{\pi}{10}$ 2) $\frac{\pi}{5}$ **3)** $\boldsymbol{\frac{\pi}{10}}$ 4) $-\frac{\pi}{5}$

8. The domain of the function defined by $f(x) = \boldsymbol{sin^{-1}\sqrt{x-1}}$is

1) [1,2] 2) [-1,1] 3) [0,1] 4) [-1,0]

9. If $\boldsymbol{x = \frac{1}{5}}$, the value of $\mathbf{cos}(\boldsymbol{cos^{-1}x + 2sin^{-1}x})$ is

1) $-\sqrt{\frac{24}{25}}$ 2) $\sqrt{\frac{24}{25}}$ 3) $\frac{1}{5}$ **4)** $-\frac{1}{5}$

10. $\boldsymbol{tan^{-1}\left(\frac{1}{4}\right) + tan^{-1}\left(\frac{2}{9}\right)}$ is equal to

1) $\frac{1}{2}cos^{-1}\left(\frac{3}{5}\right)$ 2) $\frac{1}{2}sin^{-1}\left(\frac{3}{5}\right)$ 3) $\frac{1}{2}tan^{-1}\left(\frac{3}{5}\right)$ **4)** $\boldsymbol{tan^{-1}\left(\frac{1}{2}\right)}$

11. If the function $\boldsymbol{f(x) = sin^{-1}(x^2 - 3)}$, then x belongs to

1) [-1,1] 2) $[\sqrt{2}, 2]$ **3)** $\boldsymbol{[-2, -\sqrt{2}] \cup [\sqrt{2}, 2]}$ 4) $[-2, -\sqrt{2}] \cap [\sqrt{2}, 2]$

12. If $\boldsymbol{cot^{-1}2}$ **and** $\boldsymbol{cot^{-1}3}$ are two angles of a triangle, then the **third angle** is

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

13. $\boldsymbol{sin^{-1}\left(\tan\frac{\pi}{4}\right) - sin^{-1}\left(\sqrt{\frac{3}{x}}\right) = \frac{\pi}{6}}$. Then $\boldsymbol{x}$ is a root of the equation

1) $x^2 - x - 6 = 0$ **2)** $\boldsymbol{x^2 - x - 12 = 0}$

3) $x^2 + x - 12 = 0$ 4) $x^2 + x - 6 = 0$

14. $\boldsymbol{sin^{-1}(2cos^2x - 1) + cos^{-1}(1 - 2sin^2x) =}$

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

15. If $\boldsymbol{cot^{-1}(\sqrt{\sin\alpha}) + tan^{-1}(\sqrt{\sin\alpha}) = u}$, then $\boldsymbol{cos2u}$ is equal to

1) $tan^2\alpha$ 2) 0 **3) -1** 4) $tan2\alpha$

16. If $|\boldsymbol{x}| \leq \mathbf{1}$, then $\boldsymbol{2\,tan^{-1}x - sin^{-1}\frac{2x}{1+x^2}}$ is equal to

1) $tan^{-1}x$ 2) $sin^{-1}x$ **3) 0** 4) π

17. The equation $\boldsymbol{tan^{-1}x - cot^{-1}x = tan^{-1}\left(\frac{1}{\sqrt{3}}\right)}$ has

1) no solution **2) unique solution**

3) two solution 4) infinite number of solution

18. If $\boldsymbol{sin^{-1}x - cot^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{2}}$, then x is equal to

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

19. If $\boldsymbol{sin^{-1}\frac{x}{5} + cosec^{-1}\frac{5}{4} = \frac{\pi}{2}}$, then the value of x is

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

20. $\sin(tan^{-1}x), |x| < 1$ is equal to

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

Chapter -5 Two Dimensional Analytical Geometry

1. The equation of the **circle** passing through **(1,5)and (4,1)** and touching y -axis is $x^2 + y^2 - 5x - 6y + 9 + \lambda(4x + 3y - 19) = 0$ where λ is equal to

1) $0, -\frac{40}{9}$ 2) 0 3) $\frac{40}{9}$ 4) $-\frac{40}{9}$

2. The **eccentricity of the hyperbola** whose **latus rectum is 8** and **conjugate axis is equal to half the distance between the foci** is

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

3. The **circle** $x^2 + y^2 = 4x + 8y + 5$ intersects **the line** $3x - 4y = m$ at two distinct points if

1) $15 < m < 65$ 2) $35 < m < 85$ 3) $-85 < m < -35$ **4)** $-35 < m < 15$

4. The **length of the diameter of the circle** which touches the $x - axis$ at the point **(1,0)** and passes through the point **(2,3).**

1) $\frac{6}{5}$ 2) $\frac{5}{3}$ **3)** $\frac{10}{3}$ 4) $\frac{3}{5}$

5. The radius of the circle $3x^2 + by^2 + 4bx - 6by + b^2 = 0$ is

1) 1 2) 3 **3)** $\sqrt{10}$ 4) $\sqrt{11}$

6. The centre of the circle inscribed in a square formed by the lines $x^2 - 8x - 12 = 0$ and $y^2 - 14y + 15 = 0$ is

1) (4 ,7) 2)(7 ,4) 3) (9 ,4) 4) (4, 9)

7. The **equation of the normal** to the circle $x^2 + y^2 - 2x - 2y + 1 = 0$ which is **parallel to the line** $2x + 4y = 3$ is

1) $x + 2y = 3$ 2) $x + 2y + 3 = 0$ 3) $2x + 4y + 3 = 0$ 4) $x - 2y + 3 = 0$

8. If $P(x, y)$ be any point on $16x^2 + 25y^2 = 400$ with foci $F_1(3, 0)$ and $F_2(-3, 0)$ then $PF_1 + PF_2$ is

1) 8 2) 6 **3) 10** 4) 12

9.The radius of the circle passing through the point **(6,2)** two of whose diameter are $\boldsymbol{x+y=6}$ **and** $\boldsymbol{x+2y=4}$ is

1) 10 **2)** $\boldsymbol{2\sqrt{5}}$ 3) 6 4) 4

10. The **area of quadrilateral** formed with **foci of the hyperbolas**$\boldsymbol{\frac{x^2}{a^2}-\frac{y^2}{b^2}=1}$ **and** $\boldsymbol{\frac{x^2}{a^2}-\frac{y^2}{b^2}=-1}$ is

1) $4(a^2+b^2)$ **2)** $\boldsymbol{2(a^2+b^2)}$ 3) a^2+b^2 4) $\frac{1}{2}(a^2+b^2)$

11. If the normals of the parabola $\boldsymbol{y^2=4x}$ drawn at the end points of its latus rectum are tangents to the circle$\boldsymbol{(x-3)^2+(y+2)^2=r^2}$, then the value of r^2 is

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

12. If $\boldsymbol{x+y=k}$ is a **normal** to the parabola $\boldsymbol{y^2=12x}$, then the value of k is

1) 3 2) -1 3) 1 **4) 9**

13. The ellipse $\boldsymbol{E_1:\frac{x^2}{9}+\frac{y^2}{4}=1}$ is inscribed in a rectangle R whose sides are parallel to the coordinate axes. Another ellipse E_2 passing through the point **(0,4)** circumscribes the **rectangle R** . The eccentricity of the ellipse is

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

14. Tangents are drawn to the hyperbola $\boldsymbol{\frac{x^2}{9}+\frac{y^2}{4}=1}$ parallel to the straight line $\boldsymbol{2x-y=1}$. One of the **points of contact** of **tangents** on the hyperbola is

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

15. The equation of the circle passing through the foci of the ellipse $\boldsymbol{\frac{x^2}{16}+\frac{y^2}{9}=1}$ having centre at **(0,3)** is

1) $\boldsymbol{x^2+y^2-6y-7=0}$ 2) $x^2+y^2-6y+7=0$

3) $x^2+y^2-6y-5=0$ 4)$x^2+y^2-6y+5=0$

16. Let C be the circle with **centre at (1,1)** and **radius = 1**. If T is the circle centered at **(0,$\boldsymbol{y}$)** passing through the origin and touching the circle C e**xternally**, then the radius of T is equal to

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

17. Consider an **ellipse** whose centre is of the origin and its major axis is along x-axis. If its **eccentrcity is** $\frac{3}{5}$and the **distance between its foci is 6**, then the **area of the quadrilateral** inscribed in the ellipse with diagonals as major and minor axis of the ellipse is

1) 8 2) 32 3) 80 **4) 40**

18. **Area of the greatest rectangle** inscribed in the **ellipse** $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is

1) $2ab$ 2) ab 3) $\sqrt{ab}$ 4) $\frac{a}{b}$

19. An ellipse has OB as semi minor axes, F and F' its foci and the angle FBF' is a right angle. Then the **eccentricity of the ellipse** is

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

20. The **eccentricity** of the **ellipse** $(x-3)^2+(y-4)^2=\frac{y^2}{9}$ is

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

21. If the **two tangents** drawn from a point P to the parabola $y^2=4x$ are at right angles then the **locus of P** is

1) $2x+1=0$ **2)** $x=-1$ 3)$2x-1=0$ 4) $x=1$

22. The **circle** passing through **(1,-2)** and touching the axis of x at **(3,0)** passing through the point

1) $(-5,2)$ 2) $(2,-5)$ **3)** $(5,-2)$ 4) $(-2,5)$

23. The locus of a point whose **distance** from **(-2,0) is** $\frac{2}{3}$ **times its distance from the line** $x=\frac{-9}{2}$ is

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

24. The values of m for which the line $y=mx+2\sqrt{5}$ touches the hyperbola $16x^2-9y^2=144$ are the roots of$x^2-(a+b)x-4=0$ then the value of $(a+b)$is

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

25. If the coordinates at one end of a diameter of the circle $x^2+y^2-8x-4y+c=0$ are $(11,2)$, the coordinates of the other end are

1) $(-5,2)$ **2)** $(-3,2)$ 3) $(5,-2)$ 4) $(-2,5)$

Chapter – 6 Application Of Vector Algebra

1. If $\vec{a}$ **and** $\vec{b}$ **are parallel vectors**, then $[\vec{a},\vec{c},\vec{b}]$ is equal to

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

2. If a vector $\vec{\alpha}$ lies in the plane **of** $\vec{\beta}$ **and** $\vec{\gamma}$, then

1) $[\vec{\alpha},\vec{\beta},\vec{\gamma}]=1$ 2) $[\vec{\alpha},\vec{\beta},\vec{\gamma}]=-1$ **3)** $[\vec{\alpha},\vec{\beta},\vec{\gamma}]=0$ 4) $[\vec{\alpha},\vec{\beta},\vec{\gamma}]=2$

3. If $\vec{a}.\vec{b}=\vec{b}.\vec{c}=\vec{c}.\vec{a}=0$, then the value of $[\vec{a},\vec{b},\vec{c}]$ is

1) $|\vec{a}||\vec{b}||\vec{c}|$ 2) $\frac{1}{3}|\vec{a}||\vec{b}||\vec{c}|$ 3) 1 4) -1

4. If $\vec{a},\vec{b},\vec{c}$ **are three unit vectors** such that $\vec{a}$ **is perpendicular to** $\vec{b}$ **, and is parallel to** $\vec{c}$ then $\vec{a}\times(\vec{b}\times\vec{c})$ is equal to

1) $\vec{a}$ **2)** $\vec{b}$ 3) $\vec{c}$ 4) $\vec{0}$

5. If $[\vec{a},\vec{b},\vec{c}]=1$, then the value of $\frac{\vec{a}.(\vec{b}\times\vec{c})}{(\vec{c}\times\vec{a}).\vec{b}}+\frac{\vec{b}.(\vec{c}\times\vec{a})}{(\vec{a}\times\vec{b}).\vec{c}}+\frac{\vec{c}.(\vec{a}\times\vec{b})}{(\vec{c}\times\vec{b}).\vec{a}}$ is

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

6. The volume of the parallelepiped with its edges represented by the vectors $\hat{\imath}+\hat{\jmath},\ \hat{\imath}+2\hat{\jmath},\ \hat{\imath}+\hat{\jmath}+\pi\hat{k}$ is

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

7. If $\vec{a}$ ***and*** $\vec{b}$ **are unit vectors** such that $[\vec{a},\vec{b},\vec{a}\times\vec{b}]=\frac{\pi}{4}$, then the **angle** between $\vec{a}$ *and* $\vec{b}$ is

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

8. If $\vec{a}=\hat{\imath}+\hat{\jmath}+\hat{k},\ \vec{b}=\hat{\imath}+\hat{\jmath},\ \vec{c}=\hat{\imath}$ and $(\vec{a}\times\vec{b})\times\vec{c}=\lambda\vec{a}+\mu\vec{b}$, then the value of $\lambda+\mu$ is

1) 0 2) 1 3) 6 4) 3

9. If $\vec{a},\vec{b},\vec{c}$ are n**on-coplanar, non-zero vectors** such that $[\vec{a},\vec{b},\vec{c}]=3$, **then** $\{[\vec{a}\times\vec{b},\vec{b}\times\vec{c},\vec{c}\times\vec{a}]\}^2$ is equal to

1) 81 2) 9 3) 27 4) 18

10. If $\vec{a},\vec{b},\vec{c}$ are three **non-coplanar vectors** such that $\vec{a}\times(\vec{b}\times\vec{c})=\frac{\vec{b}+\vec{c}}{\sqrt{2}}$, then the angle between $\vec{a}$ *and* $\vec{b}$ is

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

11. If the volume of the parallelepiped with $\vec{a}\times\vec{b}$, $\vec{b}\times\vec{c}$, $\vec{c}\times\vec{a}$ as coterminous edges is **8** cubic units, then the **volume** of the parallelepiped with $(\vec{a}\times\vec{b})\times(\vec{b}\times\vec{c})$,$(\vec{b}\times\vec{c})\times(\vec{c}\times\vec{a})$ **and** $(\vec{c}\times\vec{a})\times(\vec{a}\times\vec{b})$as coterminous edges is,

1) 8 cubic units 2) 512 cubic units **3) 64 cubic units** 4) 24 cubic units

12. Consider the vectors $\vec{a},\vec{b},\vec{c},\vec{d}$ such that $(\vec{a}\times\vec{b})\times(\vec{c}\times\vec{d})=\vec{0}$. let P_1 *and* P_2 be the planes determined by the pairs of vectors $\vec{a},\vec{b}$ *and* $\vec{c},\vec{d}$ respectively . then the **angle** between $\boldsymbol{P_1}$ ***and*** $\boldsymbol{P_2}$ is

1) 0° 2) 45° 3) 60° 4) 90°

13. If $\vec{a}\times(\vec{b}\times\vec{c})=(\vec{a}\times\vec{b})\times\vec{c}$, where $\vec{a},\vec{b},\vec{c}$ are any three vectors such that $\vec{b}.\vec{c}\neq 0$ and $\vec{a}.\vec{b}\neq 0$, then $\vec{a}$ ***and*** $\vec{c}$ are

1) perpendicular **2) parallel**

3) inclined at an angle $\frac{\pi}{3}$ 4) inclined at an angle $\frac{\pi}{6}$

14. If $\vec{a}=2\hat{\imath}+3\hat{\jmath}-\hat{k},\vec{b}=\hat{\imath}+2\hat{\jmath}-5\hat{k},\vec{c}=3\hat{\imath}+5\hat{\jmath}-\hat{k}$, then a vector perpendicular to $\vec{a}$ and lies in the plane containing $\vec{b}$ **and** $\vec{c}$ is

1) $-17\hat{\imath}+21\hat{\jmath}-97\hat{k}$ 2) $17\hat{\imath}+21\hat{\jmath}-123\hat{k}$

3) $-17\hat{\imath}-21\hat{\jmath}+97\hat{k}$ **4)** $\boldsymbol{-17\hat{\imath}-21\hat{\jmath}-97\hat{k}}$

15. The **angle** between the lines $\frac{x-2}{3}=\frac{y+1}{-2}, z=2$ and $\frac{x-1}{1}=\frac{2y+3}{3}=\frac{z+5}{2}$ is

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

16. If the line $\frac{x-2}{3}=\frac{y-1}{-5}=\frac{z+2}{2}$ lies in the plane $x+3y-\alpha z+\beta=0$, then (α,β) is

1) (-5,5) **2) (-6,7)** 3) (5,-5) 4) (6,-7)

17. The angle between the **line** $\vec{r}=(\hat{\imath}+2\hat{\jmath}-3\hat{k})+t(2\hat{\imath}+\hat{\jmath}-2\hat{k})$ and the **plane** $\vec{r}.(\hat{\imath}+\hat{\jmath})+4=0$ is

1) 0° 2) 30° **3) 45°** 4) 90°

18. The coordinates of the point where the **line** $\vec{r}=(6\hat{\imath}-\hat{\jmath}-3\hat{k})+t(-\hat{\imath}+4\hat{k})$ meets the plane $\vec{r}.(\hat{\imath}+\hat{\jmath}-\hat{k})=3$ are

1) (2,1,0) 2) (7,-1,-7) 3) (1,2,-6) **4) (5,-1,1)**

19. **Distance** from the **origin** to the **plane** $\boldsymbol{3x - 6y + 2z + 7 = 0}$ is

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

20. The **distance** between the planes $\boldsymbol{x + 2y + 3z + 7 = 0}$ and $\boldsymbol{2x + 4y + 6z + 7 = 0}$ is

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

21. If the **direction cosines** of a line are $\boldsymbol{\frac{1}{c}, \frac{1}{c}, \frac{1}{c}}$, then

1) $c = \pm 3$ **2)** $\boldsymbol{c = \pm\sqrt{3}}$ 3) $c > 0$ 4) $0 < c < 1$

22. Thevector equation $\boldsymbol{\vec{r} = (\hat{\imath} - 2\hat{\jmath} - \hat{k}) + t(6\hat{\imath} - \hat{k})}$represents a straight line passing through the points

1) (0,6,-1) and (1,-2,-1) 2) (0,6,-1) and (-1,-4,-2)

3) (1,-2,-1) and (1,4,-2) 4) (1,-2,-1) and (0,-6,1)

23. If the **distance** of the **point (1,1,1)** from **the origin is half of its distance** from the plane $\boldsymbol{x + y + z + k = 0}$, then the values of k are

1) ± 3 2) ± 6 3) $-3, 9$ **4)** $\boldsymbol{3, -9}$

24. If the planes $\boldsymbol{\vec{r}.(2\hat{\imath} - \lambda\hat{\jmath} + \hat{k}) = 3}$ and $\boldsymbol{\vec{r}.(4\hat{\imath} + \hat{\jmath} + \mu\hat{k}) = 5}$ are **parallel**, then the value of λ and μ are

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

25. If the length of the perpendicular from the origin to the plane $\boldsymbol{2x + 3y + \lambda z = 1}$, $\boldsymbol{\lambda > 0}$ $\boldsymbol{is}$ $\boldsymbol{\frac{1}{5}}$, then the value of $\boldsymbol{\lambda}$ is

1) $\boldsymbol{2\sqrt{3}}$ 2) $3\sqrt{2}$ 3) 0 4) 1

Chapter – 7 Application Of Differential Calculus

1. The **volume of a sphere** is i**ncreasing** in volume at the **rate of** $\boldsymbol{3\pi\ cm^3/sec}$. the rate of change of its **radius when radius is** $\boldsymbol{\frac{1}{2}}$ cm.

1) 3 cm/s 2) 2 cm/s 3) 1 cm/s 4) $\frac{1}{2}$ cm/s

2. A balloon rises straight up at **10 m/s**. An observer is **40 m** away from the spot where the balloon left the ground. Find the **rate of change of the balloon's angle of elevation** in **radian per second** when the **balloon is 30 metres** above the ground.

1) $\frac{3}{25}\ radians/sec$ **2)** $\boldsymbol{\frac{4}{25}\ radians/sec}$ 3) $\frac{1}{5}\ radians/sec$ 4) $\frac{1}{3}\ radians/sec$

3. The position of a particle moving along a horizontal line of any time t is given by $\boldsymbol{s(t) = 3t^2 - 2t - 8}$. The time at which the particle is at rest is

1) $t = 0$ **2)** $\boldsymbol{t = \frac{1}{3}}$ 3) $t = 1$ 4) $t = 3$

4. A stone is thrown up vertically. The height it reaches at time t seconds is given by $\boldsymbol{x = 80t - 16t^2}$. The stone reaches the **maximum height** in time t seconds is given by

1) 2 **2) 2.5** 3) 3 4) 3.5

5. Find the point on the curve $\boldsymbol{6y = x^3 + 2}$ at which $\boldsymbol{y}$ **−coordinate changes 8** times as fast as x −coordinate is

1) (4,11) 2) (4,-11) 3) (-4,11) 4) (-4,-11)

6. The **abscissa** of the point on the curve $f(x) = \sqrt{\boldsymbol{8 - 2x}}$ at which the **slope** of the **tangent** is $\boldsymbol{-0.25}$?

1) -8 **2) -4** 3) -2 4) 0

7. The **slope o**f the **line normal** to the curve $f(x) = \boldsymbol{2\cos 4x\ at\ x = \frac{\pi}{12}}$ is

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

8. The **tangent** to the curve $\boldsymbol{y^2 - xy + 9 = 0}$ is **vertical** when

1) $y = 0$ 2) $y = \pm\sqrt{3}$ 3) $y = \frac{1}{2}$ **4)** $\boldsymbol{y = \pm 3}$

9. **Angle** between $\boldsymbol{y^2 = x}$ and $\boldsymbol{x^2 = y}$ at the **origin** is

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

10. What is the value of the $\boldsymbol{\lim_{x\to 0}(\cot x - \frac{1}{x})}$?

1) 0 2) 1 3) 2 4) ∞

11. The function $\boldsymbol{sin^4x + cos^4x}$ is **increasing** in the interval

1) $\left[\frac{5\pi}{8}, \frac{3\pi}{4}\right]$ 2) $\left[\frac{\pi}{2}, \frac{5\pi}{8}\right]$ **3)** $\boldsymbol{\left[\frac{\pi}{4}, \frac{\pi}{2}\right]}$ 4) $\left[0, \frac{\pi}{4}\right]$

12. The number given by the **Rolle's theorem** for the function $\boldsymbol{x^3 - 3x^2, x \in [0, 3]}$ is

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

13. The number given by the **mean value theorem** for the function $\boldsymbol{\frac{1}{x}, x \in [1, 9]}\ is$

1) 2 2) 2.5 **3) 3** 4) 3.5

14. **The minimum** value of the function $|\mathbf{3} - \boldsymbol{x}| + \mathbf{9}$ is

1) 0 2) 3 3) 6 4) 9

15. The **maximum slope** of the **tangent** to the curve $y = \boldsymbol{e}^{\boldsymbol{x}} \sin \boldsymbol{x}, \boldsymbol{x} \in [\mathbf{0}, \mathbf{2}\boldsymbol{\pi}]$ is at

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

16. The **maximum** value of the function $\boldsymbol{x}^{\mathbf{2}}\boldsymbol{e}^{-\mathbf{2}\boldsymbol{x}}, \boldsymbol{x} > \mathbf{0}$ is

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

17. One of the **closest points** on the curve $\boldsymbol{x}^{\mathbf{2}} - \boldsymbol{y}^{\mathbf{2}} = \mathbf{4}$ to the point **(6,0)** is

1) (2,0) 2) $(\sqrt{5},1)$ **3)** $\boldsymbol{(3, \sqrt{5})}$ 4) $(\sqrt{13}, -\sqrt{3})$

18. The **maximum product** of **two positive numbers**, when their **sum of the squares is 200**, is

1) 100 2) $25\sqrt{7}$ 3) 28 4) $24\sqrt{14}$

19. The curve $\boldsymbol{y} = \boldsymbol{a}\boldsymbol{x}^{\mathbf{4}} + \boldsymbol{b}\boldsymbol{x}^{\mathbf{2}}$ with $\boldsymbol{ab} > \mathbf{0}$

1) has no horizontal tangent 2) is concave up

3) is concave down **4) has no points of inflection**

20. The point of inflection of the curve $\boldsymbol{y} = (\boldsymbol{x} - \mathbf{1})^{\mathbf{3}}$ is

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

Chapter – 8 Differentials and Partial Derivatives

1. A **circular** template has a radius of **10 cm**. The measurement of **radius** has an approximate **error of 0.02 cm**. Then the **percentage error** in calculating **area of this template** is

1) 0.2% **2) 0.4%** 3) 0.04% 4) 0.08%

2. The percentage error of **fifth root of 31** is approximately how many times the **percentage error in 31**?

1) $\boldsymbol{\frac{1}{31}}$ 2) $\frac{1}{5}$ 3) 5 4) 31

3. If $\boldsymbol{u}(\boldsymbol{x}, \boldsymbol{y}) = \boldsymbol{e}^{x^2+y^2}$, then $\frac{\partial u}{\partial x}$ is equal to

1) $e^{x^2+y^2}$ **2)** $\boldsymbol{2xu}$ 3) x^2u 4) y^2u

4. If $(x, y) = \log(e^x + e^y)$, then $\frac{\partial v}{\partial x} + \frac{\partial v}{\partial y}$ is equal to

1) $e^x + e^y$ 2) $\frac{1}{e^x+e^y}$ 3) 2 **4) 1**

5. If $w(x, y) = x^y, x > 0$, then $\frac{\partial w}{\partial x}$ is equal to

1) $x^y \log x$ 2) $y \log x$ **3) yx^{y-1}** 4) $x \log y$

6. If $f(x, y) = e^{xy}$, then $\frac{\partial^2 f}{\partial x \partial y}$ is equal to

1) xye^{xy} **2) $(1 + xy)e^{xy}$** 3) $(1 + y)e^{xy}$ 4) $(1 + x)e^{xy}$

7. If we measure the **side of a cube** to be **4 cm** with an **error of 0.1 cm**, then the error in ourcalculation of the **volume** is

1) 0.4 cu.cm 2) 0.45 cu.cm 3) 2 cu.cm **4) 4.8 cu.cm**

8. The change in the surface area $\mathbf{S = 6x^2}$ of a cube when the **edge length** varies from $\mathbf{x_0}$ **to**$\mathbf{x_0}$ + **dx** is

1) $12x_0 + dx$ **2) $12x_0\, dx$** 3) $6x_0\, dx$ 4) $6x_0 + dx$

9. The approximate change in the **volume V** of **a cube** of side x metres caused by **increasing** the **side by 1%** is

1) $0.3\, xdx\, m^3$ 2) $0.03\, xm^3$ **3) $0.03\, x^2 m^3$** 4) $0.03\, x^3 m^3$

10. If $g(x, y) = 3x^2 - 5y + 2y^2, x(t) = e^t$ and $y(t) = \cos t$, then $\frac{dg}{dt}$ is equal to

1) $6e^{2t} + 5\sin t - 4\cos t \sin t$ 2) $6e^{2t} - 5\sin t + 4\cos t \sin t$

3) $3e^{2t} + 5\sin t + 4\cos t \sin t$ 4) $3e^{2t} - 5\sin t + 4\cos t \sin t$

11. If $(x) = \frac{x}{x+1}$, then its **differential** is given by

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

12. If $u(x, y) = x^2 + 3xy + y - 2019$, then $\frac{\partial u}{\partial x}|_{(4,-5)}$is equal to

1) -4 2) -3 **3) -7** 4) 13

13**. Linear approximation** for $g(x) = \cos x\ at\ x = \frac{\pi}{2}$ is

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

14. If $w(x, y, z) = x^2(y - z) + y^2(z - x) + z^2(x - y)$, then $\frac{\partial w}{\partial x} + \frac{\partial w}{\partial y} + \frac{\partial w}{\partial z}$ is

1) $xy+yz+zx$ 2) $x(y+z)$ 3) $y(z+x)$ **4) 0**

15. If $\boldsymbol{f(x,y,z)=xy+yz+zx}$,then $\boldsymbol{f_x-f_z}$ is equal to

1) $\boldsymbol{z-x}$ 2) $y-z$ 3) $x-z$ 4) $y-x$

Chapter – 9 Application of Integration

1. The value of $\int_0^{\frac{2}{3}}\frac{dx}{\sqrt{4-9x^2}}$ is

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

2. The value of $\int_{-1}^{2}|x|\,dx$is

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

3. For any value of $n\in\mathbb{Z}$, $\int_0^{\pi}e^{\cos^2x}\cos^3[(2n+1)x]\,dx$ is

1) $\frac{\pi}{2}$ 2) π **3) 0** 4) 2

4. The value of $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}}\sin^2x\cos x\,dx$ is

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

5. The value of $\int_{-4}^{4}\left[\tan^{-1}\left(\frac{x^2}{x^4+1}\right)+\tan^{-1}\left(\frac{x^4+1}{x^2}\right)\right]dx$ is

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

6. The value of $\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}}\left(\frac{2x^7-3x^5+7x^3-x+1}{\cos^2x}\right)dx$ is

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

7. If $\boldsymbol{f(x)=\int_0^x t\cos t\,dt}$,then $\frac{df}{dx}=$

1) $\cos x-x\sin x$ 2) $\sin x+x\cos x$ **3) $\boldsymbol{x\cos x}$** 4) $x\sin x$

8. The **area** between $\boldsymbol{y^2=4x}$ and its **latus rectum** is

1) $\frac{2}{3}$ 2) $\frac{4}{3}$ **3) $\boldsymbol{\frac{8}{3}}$** 4) $\frac{5}{3}$

9. The value of $\int_0^1 x(1-x)^{99}\,dx$ is

1) $\frac{1}{11000}$ **2) $\boldsymbol{\frac{1}{10100}}$** 3) $\frac{1}{10010}$ 4) $\frac{1}{10001}$

10. The value of $\int_0^{\pi} \frac{dx}{1+5^{\cos x}}$ is

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

11. If $\frac{\Gamma(n+2)}{\Gamma(n)} = \mathbf{90}$ then n is

1) 10 2) 5 3) 8 **4) 9**

12. The value of $\int_0^{\frac{\pi}{6}} \boldsymbol{cos^3 3x\, dx}$ is

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

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

1) $\frac{3\pi}{10}$ **2)** $\boldsymbol{\frac{3\pi}{8}}$ 3) $\frac{3\pi}{4}$ 4) $\frac{3\pi}{2}$

14. The value of $\int_0^{\infty} \boldsymbol{e^{-3x} x^2 dx}$ is

1) $\frac{7}{27}$ 2) $\frac{5}{27}$ 3) $\frac{4}{27}$ **4)** $\boldsymbol{\frac{2}{27}}$

15. If $\int_0^{a} \frac{1}{4+x^2} \boldsymbol{dx} = \frac{\pi}{8}$ then a is

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

16. The **volume** of solid of revolution of the region bounded by $\boldsymbol{y^2 = x(a-x)}$ about $\boldsymbol{x}$**-axis** is

1) πa^3 2) $\frac{\pi a^3}{4}$ 3) $\frac{\pi a^3}{5}$ **4)** $\boldsymbol{\frac{\pi a^3}{6}}$

17. If $f(\boldsymbol{x}) = \int_1^{x} \frac{e^{\sin u}}{u} \boldsymbol{du, x > 1}$ and $\int_1^{3} \frac{e^{\sin x^2}}{x} \boldsymbol{dx} = \frac{1}{2}[\boldsymbol{f(a) - f(1)}]$, then one of the possible value of a is

1) 3 **2) 6** 3) 9 4) 5

18. The value of $\int_0^{1} \boldsymbol{(sin^{-1}x)^2 dx}$ is

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

19. The value of $\int_0^{a} \boldsymbol{(\sqrt{a^2 - x^2})^3 dx}$ is

1) $\frac{\pi a^3}{16}$ **2)** $\boldsymbol{\frac{3\pi a^4}{16}}$ 3) $\frac{3\pi a^2}{8}$ 4) $\frac{3\pi a^4}{8}$

20. If $\int_0^{x} \boldsymbol{f(t)dt = x} + \int_x^{1} \boldsymbol{tf(t)dt}$, then the value of $\boldsymbol{f(1)}$ is

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

Chapter – 10 Ordinary Differential Equation

1. The **order** and **degree** of the differential equation $\frac{d^2y}{dx^2} + (\frac{dy}{dx})^{\frac{1}{3}} + x^{\frac{1}{4}} = 0$ are respectively

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

2. The differential equation representing the family of curves $y = Acos(x + B)$, where A and B are parameters, is

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

3. The **order** and **degree** of the differential equation $\sqrt{sinx}(dx + dy) = \sqrt{cosx}(dx - dy)$ is

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

4. The **order** of the differential equation of all **circles** with **centre at (h, k) and radius 'a'** is

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

5. The differential equation of the family of curves $y = Ae^x + Be^{-x}$, where A and B are arbitrary constants is

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

6. The **general solution** of the differential equation $\frac{dy}{dx} = \frac{y}{x}$ is

1) $xy = k$ 2) $y = k\ logx$ **3)** $\boldsymbol{y = kx}$ 4) $logy = kx$

7. The **solution** of the differential equation $2x\frac{dy}{dx} - y = 3$ represents

1) straight line 2) circles **3) parabola** 4) ellipse

8.The solution of $\frac{dy}{dx} + p(x)y = 0\ is$

1) $y = ce^{\int pdx}$ **2)** $\boldsymbol{y = ce^{-\int pdx}}$ 3) $x = ce^{-\int pdy}$ 4) $x = ce^{\int pdy}$

9. The **integrating factor** of the differential equation $\frac{dy}{dx} + y = \frac{1+y}{\lambda}$ is

1) $\frac{x}{e^\lambda}$ **2)** $\boldsymbol{\frac{e^\lambda}{x}}$ 3) λe^x 4) e^x

10. The **integrating factor** of the differential equation $\frac{dy}{dx} + p(x)y = Q(x)$ is x, then $P(x)$

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

11. The **degree** of the differential equation $y(x) = 1 + \frac{dy}{dx} + \frac{1}{1.2}(\frac{dy}{dx})^2 + \frac{1}{1.2.3}(\frac{dy}{dx})^3 + \cdots$ is

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

12. If p and q are the order and degree of the differential equation $\boldsymbol{y\frac{dy}{dx}+x^3\left(\frac{d^2y}{dx^2}\right)+xy=}$ $\boldsymbol{cosx}$, when

1) $p<q$ 2) $p=q$ **3)** $\boldsymbol{p>q}$ 4) $p\ exists\ and\ q\ does\ not\ exists$

13. The solution of the differential equation $\boldsymbol{\frac{dy}{dx}+\frac{1}{\sqrt{1-x^2}}=0}$ is

1) $\boldsymbol{y+\sin^{-1}x=c}$ 2) $x+\sin^{-1}y=0$ 3) $y^2+2\sin^{-1}x=C$ 4) $x^2+2\sin^{-1}y=0$

14. The solution of the differential equation $\boldsymbol{\frac{dy}{dx}=2xy}$ is

1) $\boldsymbol{y=Ce^{x^2}}$ 2) $y=2x^2+C$ 3) $y=Ce^{-x^2}+C$ 4) $y=x^2+C$

15. The general solution of the differential equation $\boldsymbol{\log\left(\frac{dy}{dx}\right)=x+y}$ is

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

16. The solution of $\boldsymbol{\frac{dy}{dx}=2^{y-x}}$ is

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

17. The solution of the differential equation $\boldsymbol{\frac{dy}{dx}=\frac{y}{x}+\frac{\phi\left(\frac{y}{x}\right)}{\phi\left(\frac{y}{x}\right)}}$ is

1) $x\phi\left(\frac{y}{x}\right)=k$ **2)** $\boldsymbol{\phi\left(\frac{y}{x}\right)=kx}$ 3) $y\phi\left(\frac{y}{x}\right)=k$ 4) $\phi\left(\frac{y}{x}\right)=ky$

18. If $\boldsymbol{\sin x}$ is the **integrating factor** of the linear differential equation $\boldsymbol{\frac{dy}{dx}+Py=Q}$, then P is

1) $\log\sin x$ 2) $\cos x$ 3) $\tan x$ **4)** $\boldsymbol{\cot x}$

19. The **number of arbitrary constants** in the general solutions of order $\boldsymbol{n}$ and $\boldsymbol{n+1}$ are respectively

1) $n-1,n$ **2)** $\boldsymbol{n,n+1}$ 3) $n+1,n+2$ 4) $n+1,n$

20. The **number of arbitrary constants** in the particular solution of a differential equation of **third order** is

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

21. Integrating factor of the differential equation $\boldsymbol{\frac{dy}{dx}=\frac{x+y+1}{x+1}}$ is

1) $\boldsymbol{\frac{1}{x+1}}$ 2) $x+1$ 3) $\frac{1}{\sqrt{x+1}}$ 4) $\sqrt{x+1}$

22. The **population P** in any year t is such that the **rate of increase in the population** is proportional to the population. Then

1) $P = Ce^{kt}$ 2) $P = Ce^{-kt}$ 3) $P = Ckt$ 4) $P = C$

23. P is the amount of certain substance left in after time t .If the **rate of evaporation** of the substance is proportional to the amount remaining , then

1) $P = Ce^{kt}$ **2) $P = Ce^{-kt}$** 3) $P = Ckt$ 4) $Pt = C$

24. If the solution of the differential equation $\frac{dy}{dx} = \frac{ax+3}{2y+f}$ represents a circle, then the value of a is

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

25. The slope at any point of a curve $y = f(x)$ is given by $\frac{dy}{dx} = 3x^2$ and it passes through (-1,1). Then the equation of the curve is

1) $y = x^3 + 2$ 2) $y = 3x^2 + 4$ 3) $y = 3x^3 + 4$ 4) $y = x^3 + 5$

Chapter – 11 Probability Distributions

1. Let X be random variable with probability density function

$$f(x) = \begin{cases} \frac{2}{x^3}, & x \geq 1 \\ 0, & x < 1 \end{cases}$$

Which of the following statement is correct?

(1) both mean and variance exist **(2) mean exists but variance does not exist**

(3) both mean and variance do not exist (4) variance exists but Mean does not exist.

2. A rod of length 2l is broken into two pieces at random. The probability density function of the shorter of the two pieces is

$$f(x) = \begin{cases} \frac{1}{l}, & 0 < x < l \\ 0, & l \leq x < 2l \end{cases}$$

The mean and variance of the shorter of the two pieces are respectively

1) $\frac{l}{2}, \frac{l^2}{3}$ 2) $\frac{l}{2}, \frac{l^2}{6}$ 3) $l, \frac{l^2}{12}$ **4) $\frac{l}{2}, \frac{l^2}{12}$**

3. Consider a game where the player tosses a **six-sided fair die**. If the face that comes up is **6**, the player **wins 36 rupees**, otherwise he **loses k^2** rupees , where k is the face that comes up **k = {1, 2, 3, 4, 5}.**

The expected **amount to win** at this game in rupees is

1) $\frac{19}{6}$ **2)$-\frac{19}{6}$** 3) $\frac{3}{2}$ 4) $-\frac{3}{2}$

4. A pair of disc numbered **1, 2, 3, 4, 5, 6** of a six-sided die and **1, 2, 3, 4 of a four-sided die** is rolled and the **sum** is determined. Let the random variable X denote this sum. Then thenumber of elements in the **inverse image of 7** is

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

5. A random variable X has **binomial distribution** with **n = 25** and **p = 0.8** then standard deviation of X is

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

6. Let **X** represent the **difference between the number of heads and the number of tails** obtained when a coin is tossed n times. Then the possible values of X are

1) i+2n, i= 0,1,2...**n** **2) 2i–n, i= 0,1,2...n**

3) n–i, i= 0,1,2...n 4) 2i+2n, i= 0,1,2...n

7. If the function $\boldsymbol{f(x) = \frac{1}{12}}$ **for**$\boldsymbol{a < x < b}$, represents a probability density function of acontinuous random variable X, then which of the following cannot be the value of a and b?

1) 0 and 12 2) 5 and 17 3) 7 and 19 **4) 16 and 24**

8. **Four buses carrying 160 students** from the same school arrive at a football stadium. The buses carry, respectively, **42, 36, 34, and 48 students**. One of the students is randomly selected. Let X denote the number of students that were on the bus carrying the randomly selected student.One of the 4 bus drivers is also randomly selected. Let Y denote the number of students onthat bus. Then **E[X]** and **E[Y]** respectively are

1) 50, 40 2) 40,50 **3) 40.75, 40** 4) 41,41

9. **Two coins** are to be flipped. The **first coin** will land on heads with probability **0.6**, the **second** with Probability **0.5**. Assume that the results of the flips are independent, and let X equal thetotal number of heads that result. The value of E[X] is

1) 0.11 **2) 1.1** 3) 11 4)1

10. On a multiple-choice exam with **3 possible destructives** for each of the **5** questions, the probability that a student will get **4 or more correct answers** just by guessing is

1) $\frac{11}{243}$ 2) $\frac{3}{8}$ 3) $\frac{1}{243}$ 4) $\frac{5}{243}$

11. If $P[X=0]=1-P[X=1]$. If $E[X]=3\,Var(X)$, then $P[X=0]$.

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

12. If X is a binomial random variable with **expected value 6 and variance 2.4,** then $P[X=5]$ is

1) $\binom{10}{5}\left(\frac{3}{5}\right)^6\left(\frac{2}{5}\right)^4$ 2) $\binom{10}{5}\left(\frac{3}{5}\right)^5$ 3) $\binom{10}{5}\left(\frac{3}{5}\right)^4\left(\frac{2}{5}\right)^6$ **4) $\binom{10}{5}\left(\frac{3}{5}\right)^5\left(\frac{2}{5}\right)^5$**

13. The random variable X has the probability density function

$f(x)=\begin{cases} ax+b, & 0<x<1 \\ 0, & otherwise \end{cases}$ and $E(X)=\frac{7}{12}$, then a **and** b are respectively

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

14. Suppose that X takes on one of the values **0,1, and 2**. If for some constant ,$P(X=i)=kP(X=i-1)\ for\ i=1,2\ and\ P(X=0)=\frac{1}{7}$. Then the value of k is

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

15. Which of the following is a **discrete random variable**?

I. The number of cars crossing a particular signal in a day.

II. The number of customers in a queue to buy train tickets at a moment.

III. The time taken to complete a telephone call.

1) I and II 2) II only 3) III only 4) II and III

16. **If** $f(x)=\begin{cases} 2x & ,0\le x\le a \\ 0 & ,otherwise \end{cases}$ is a probability density function of a random variable, then the value of a is

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

17. The probability function of a random variable is defined as:

x	-2	-1	0	1	2
$f(x)$	k	$2k$	$3k$	$4k$	$5k$

Then $E(X)$ is equal to :

1) $\frac{1}{15}$ 2) $\frac{1}{10}$ 3) $\frac{1}{3}$ **4)** $\frac{2}{3}$

18. Let X have a Bernoulli distribution with **mean 0.4**, then the variance of $(\boldsymbol{2X-3})$ is

1) 0.24 2) 0.48 3) 0.6 **4) 0.96**

19. If in **6 trials**, X is a binomial variate which follows the relation $\boldsymbol{9P(X=4) = P(X=2)}$, then theprobability of success is

1) 0.125 **2) 0.25** 3) 0.375 4) 0.75

20. A computer salesperson knows from his past experience that he sells computers to **one in every twenty customers** who enter the showroom. What is the probability that he will sell acomputer to **exactly two of the next three customers**?

1) $\boldsymbol{\frac{57}{20^3}}$ 2) $\frac{57}{20^2}$ 3) $\frac{19^3}{20^3}$ 4) $\frac{57}{20}$

<u>Chapter – 12 Discrete Mathematics</u>

1) A **binary operation** on a set S is a function from

1) $S \to S$ **2)** $\boldsymbol{(S \times S) \to S}$ 3) $S \to (S \times S)$ 4) $(S \times S) \to (S \times S)$

2. **Subtraction** is **not a binary** operation in

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

3.Which one of the following is a **binary operation** on $\mathbb{N}$?

1) Subtraction **2) Multiplication** 3) Division 4) All the above

4. In the set $\mathbb{R}$ of real numbers '$*$ ' is defined as follows. Which one of the following is **not a binary operation on** $\mathbb{R}$?

1) $a * b = \min(a.b)$ 2) $a * b = \max(a,b)$

3) $a * b = a$ **4)** $\boldsymbol{a * b = a^b}$

5. The operation * defined by $\boldsymbol{a * b = \frac{ab}{7}}$ is not a binary operation on

1) $\mathbb{Q}^+$ **2)** $\mathbb{Z}$ 3) $\mathbb{R}$ 4) $\mathbb{C}$

6. In the set $\mathbb{Q}$ define $\boldsymbol{a \odot b = a + b + ab}$. For what value of , $\boldsymbol{3 \odot (y \odot 5) = 7}$?

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

7. If $a * \boldsymbol{b} = \sqrt{\boldsymbol{a^2 + b^2}}$ on the real numbers then * is

1) commutative but not associative 2) associative but not commutative

3) both commutative and associative 4) neither commutative nor associative

8. Which one of the following statements has the **truth value T**?

1) sin x is an even function. 2) Every square matrix is non-singular

3) The product of complex number and its conjugate is purely imaginary

4) $\sqrt{5}$is an irrational number

9.Which one of the following statements has truth value F?

1) Chennai is in India or $\sqrt{2}$ is an integer

2) Chennai is in India or $\sqrt{2}$ is an irrational number

3) Chennai is in China or $\sqrt{2}$ is an integer

4) Chennai is in China or $\sqrt{2}$ is an irrational number

10.If a compound statement involves **3 simple statements**, then the **number of rows** in the truth table is

1) 9 **2) 8** 3) 6 4) 3

11. Which one is the **inverse** of the statement $(\boldsymbol{p} \vee \boldsymbol{q}) \rightarrow (\boldsymbol{p} \wedge \boldsymbol{q})$?

1) $(\boldsymbol{p} \wedge \boldsymbol{q}) \rightarrow (\boldsymbol{p} \vee \boldsymbol{q})$ 2) $\backsim (p \vee q) \rightarrow (p \wedge q)$

3) $(\backsim p \vee \backsim q) \rightarrow (\backsim p \wedge \backsim q)$ 4) $(\backsim p \wedge \backsim q) \rightarrow (\backsim p \vee \backsim q)$

12. Which one is the **contrapositive** of the statement $(\boldsymbol{p} \vee \boldsymbol{q}) \rightarrow \boldsymbol{r}$?

1) $\backsim \boldsymbol{r} \rightarrow (\backsim \boldsymbol{p} \wedge \backsim \boldsymbol{q})$ 2) $\backsim r \rightarrow (p \vee q)$ 3) $r \rightarrow (p \wedge q)$ 4) $p \rightarrow (q \vee r)$

13. The truth table for $(p \wedge q) \vee \backsim q$ is given below

p	q	$(p \wedge q) \vee \backsim q$
T	T	(a)
T	F	(b)
F	T	(c)
F	F	(d)

Which one of the following is true?

	(a)	(b)	(c)	(d)
(1)	T	T	T	T

(2) T F T T

(3) T T F T

(4) T F F F

14. In the **last column** of the truth table for $\sim(\boldsymbol{p} \vee \sim \boldsymbol{q})$ the number of **final outcomes of the truth value** $\boldsymbol{'F'}$ are

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

15. Which one of the following is **incorrect**? For any **two propositions** $\boldsymbol{p\ and\ q}$, we have

1) $\sim(p \vee q) \equiv \sim p \wedge \sim q$ 2) $\sim(p \wedge q) \equiv \sim p \vee \sim q$

3) $\sim(\boldsymbol{p} \vee \boldsymbol{q}) \equiv \sim \boldsymbol{p} \vee \sim \boldsymbol{q}$ 4) $\sim(\sim p) \equiv p$

16.

p	q	$(p \wedge q) \to \sim p$
T	T	(a)
T	F	(b)
F	T	(c)
F	F	(d)

Which one of the following is correct for the truth value of $(\boldsymbol{p} \wedge \boldsymbol{q}) \to \sim \boldsymbol{p}$?

	(a)	(b)	(c)	(d)
(1)	T	T	T	T
(2)	**F**	**T**	**T**	**T**
(3)	F	F	T	T
(4)	T	T	T	F

17. The **dual of** $\sim(\boldsymbol{p} \vee \boldsymbol{q}) \vee [\boldsymbol{p} \vee (\boldsymbol{p} \wedge \sim \boldsymbol{r})]$ is

1) $\sim(p \wedge q) \wedge [p \vee (p \wedge \sim r)]$ 2) $(p \wedge q) \wedge [p \wedge (p \vee \sim r)]$

3) $\sim(\boldsymbol{p} \wedge \boldsymbol{q}) \wedge [\boldsymbol{p} \wedge (\boldsymbol{p} \wedge \boldsymbol{r})]$ 4) $\sim(p \wedge q) \wedge [p \wedge (p \vee \sim r)]$

18. The proposition $p \wedge (\sim p \vee q)$ is

1) a tautology 2) a contradiction

3) logically equivalent to p∧q 4) logically equivalent to p∨q

19. Determine the truth value of each of the following statements:

(a) 4+2=5 and 6+3=9 (b) 3+2=5 and 6+1=7

(c) 4+5=9 and1+2= 4 (d) 3+2=5 and 4+7=11

	(a)	(b)	(c)	(d)
(1)	**F**	**T**	**F**	**T**
(2)	T	F	T	F
(3)	T	T	F	F
(4)	F	F	T	T

20. Which one of the following is **not true**?

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

2) If the last column of the truth table contains only T then it is a tautology.

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

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