A Valuable material from SS PRITHVI's

Class 12

2023-24

PRIT EDUCATION
Practice ! Perform ! Perfect !

PRITEDUCATION
PRACTISE! PERFORM! PERFECT!

1 MARKS

100% 20/20 CONFIRM

SUBJECT:

M A T H

MR. SS PRITHVI

CONTENTS

PTA 2023-24
CREATED 1 MARKS

OBJECTIVE TYPE QUESTIONS
(Created from the Text Book)

CHAPTER 1

1. Which of the following are correct?

(i) $|A^{-1}| = \frac{1}{|A|}$ (ii) $(A^T)^{-1} = (A^{-1})^T$ (iii) $(\lambda A^{-1}) = \frac{1}{\lambda}A^{-1}, \lambda \neq 0$

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

2. Which of the following are incorrect?

(i) A is non singular and $AB = AC \Rightarrow B = C$

(ii) A is non singular and $BA = CA \Rightarrow B = C$

(iii) A and B are non singular of same order then $(AB)^{-1} = B^{-1}A^{-1}$

(iv) A is non singular then $A = (A^{-1})^{-1}$

(1) none (2) (i) and (ii) (3) (ii) and (iii) (4) (iii) and (iv)

3. Which of the following is incorrect?

(1) $adj(adj\,A) = |A|^{n-2} A$ (2) $|adjA| = A^{n-1}$

(3) $|adj(adjA)| = |A|^{(n-1)^2}$ (4) $(adjA)^T = adj(A^T)$

4. A is of order n, $\lambda \neq 0$ then $adj(\lambda A) =$

(1) $\lambda^{n-1}adj(A)$ (2) $\lambda^{n-2}adj(A)$ (3) $\frac{1}{\lambda}adj(A)$ (4) $\lambda^{n}adj(A)$

5. If A is a n, non singular matrix then $[adj(A)]^{-1}$ is

(1) $\neq adj(A^{-1})$ and $= \frac{1}{|A|}A$ (2) $= adj(A^{-1})$ and $\neq \frac{1}{|A|}A$

(3) $\neq adj(A^{-1})$ and $\neq \frac{1}{|A|}A$ (4) $= adj(A^{-1})$ and $= \frac{1}{|A|}A$

6. Consider the statements :

A : A is symmetric $\Rightarrow$ $adjA$ is symmetric

B : $adj(AB) = adj(A) \cdot adj(B)$

Choose the correct option

(1) Both statements are correct (2) Neither statements are correct

(3) A is correct, B is incorrect (4) A is incorrect, B is correct

7. A is orthogonal and consider the statements and select the suitable option :

A : $A^{-1} = A^T$

B : $AA^T = A^TA = I$

(1) A and B are true (2) A only true

(3) B only true (4) both are false

8. Which of the following are correct in the case of a rank of a matrix A of order $m \times n$?
   (i) rank of I_n is n
   (ii) A is of order $m \times n$ then $\rho(A) \leq \min(m,n)$
   (iii) The necessary and sufficient condition to find inverse of an $n \times n$ matrix is $\rho(A) = n$
   (1) all (2) (i) and (iii) (3) (ii) and (iii) only (4) (iii) and (iv)
9. In the case of Cramer's rule which of the following are correct?
   (i) $\Delta = 0$ (ii) $\Delta \neq 0$
   (iii) the system has unique solution (iv) the system has infinitely many solutions
   (1) (i) and (iv) (2) (ii) and (iii) (3) all (4) none
10. If ρ represents the rank and, A and B are $n \times n$ matrices, then
    (1) $\rho(A+B) = \rho(A) + \rho(B)$ (2) $\rho(AB) = \rho(A)\rho(B)$
    (3) $\rho(A-B) = \rho(A) - \rho(B)$ (4) $\rho(A+B) \leq n$

CHAPTER 2

1. If $\sqrt{-1} = i$ and $n \in \mathbb{N}$ then
   (1) $i^{4n+3} = -i$ (2) $i^{8n+2} = 1$ (3) $i^{100n+4} = -1$ (4) $i^{4n+5} = 1$
2. Which of the statement is incorrect if $i = \sqrt{-1}$ and z is any complex number?
   (1) iz is obtained by rotating z in the anti clockwise direction through an angle $\frac{\pi}{2}$
   (2) iz is obtained by rotating z in the clockwise direction through an angle $\frac{\pi}{2}$
   (3) $-z$ is obtained by rotating z in the anti clockwise direction through an angle π.
   (4) $-iz$ is obtained by rotating z in the clockwise direction through an angle $\frac{\pi}{2}$.
3. Find the correct statements.
   (i) Conjugate of the sum of two complex numbers is equal to the sum of their conjugates.
   (ii) Conjugate of the difference of two complex numbers is equal to the difference of their conjugates.
   (iii) Conjugate of the product of two complex numbers is equal to the product of their conjugates.
   (iv) Conjugate of the quotient of two complex numbers is equal to the quotient of their conjugates.
   (1) all (2) (i) and (iii) only (3) (i) and (iv) only (4) (ii), (iii), (iv) only
4. Identify the incorrect statement.
   (1) $|z|^2 = 1 \Rightarrow \frac{1}{z} = \bar{z}$ (2) $\text{Re}(z) \leq |z|$
   (3) $||z_1| - |z_2|| \geq |z_1 + z_2|$ (4) $|z^n| = |z|^n$

5. If $|z-z_1|=|z-z_2|$, the locus of z is

(1) the perpendicular bisector of line joining z_1 and z_2

(2) a line parallel to the line joining the points z_1 and z_2

(3) a circle, where z_1 and z_2 are the end points of a diameter

(4) a line joining z_1 and z_2.

6. Which of the following are correct statements?

(i) $e^{-i\theta}=\cos\theta-i\sin\theta$ (ii) $e^{i\frac{\pi}{2}}=i$

(iii) $e^{i(x+iy)}=e^{-y}(\cos x+i\sin x)$ (iv) $e^{-i(y-ix)}=e^{-x}(\cos y-i\sin y)$

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

7. Which of the following are correct?

(i) $\arg(z_1+z_2)=\arg(z_1)+\arg(z_2)$ (ii) $\arg(z_1-z_2)=\arg(z_1)-\arg(z_2)$

(iii) $\arg(z_1z_2)=\arg(z_1)+\arg(z_2)$ (iv) $\arg\left(\frac{z_1}{z_2}\right)=\arg(z_1)-\arg(z_2)$

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

8. Which of the following are incorrect?

(i) $(\cos\theta+i\sin\theta)^m=\cos m\theta+i\sin m\theta$ if m is a negative integer

(ii) $(\sin\theta+i\cos\theta)^n=\cos n\left(\frac{\pi}{2}-\theta\right)+i\sin n\left(\frac{\pi}{2}-\theta\right)$

(iii) $(\cos\theta-i\sin\theta)^{-m}=\cos m\theta+i\sin m\theta$ if m is a negative integer

(iv) $(\cos\theta-i\sin\theta)^n=\cos n\theta-i\sin n\theta$

(1) none (2) (i) and (iv) (3) (i) and (ii) (4) (iii) and (iv)

9. In the case n^{th} roots of unity, identify the correct statements.

(i) the roots are in G.P

(ii) sum of the roots is zero

(iii) Product of the roots is $(-1)^{n+1}$

(iv) the roots are lying on a unit circle

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

10. $cis\frac{28}{5}\pi$ is equal to

(1) $cis\left(-\frac{2\pi}{5}\right)$ (2) $cis\left(\frac{2\pi}{5}\right)$ (3) $cis\left(\frac{3\pi}{5}\right)$ (4) $cis\left(-\frac{3\pi}{5}\right)$

CHAPTER 3

1. The statement "A polynomial equation of degree n has exactly n roots which are either real or complex" is
   (1) Fundamental theorem of Algebra (2) Rational root theorem
   (3) Descartes rule (4) Complex conjugate root theorem
2. Identify the correct answer regarding the statements
   Statement A : If a complex number z_0 is a root of $p(x)=0$ then $\bar{z}_0$ is also a root.
   Statement B : For a polynomial equation with real coefficients, complex (imaginary) roots occur in conjugate pairs
   (1) Both are true (2) Both are false
   (3) A is false, B is true (4) A is false, B is true
3. If $p+\sqrt{q}$ and $-i\sqrt{q}$ are the roots of a polynomial equation with rational coefficients then the least possible degree of the equation is
   (1) 2 (2) 1 (3) 3 (4) 4
4. If $\frac{p}{q}$ (where p and q are co-primes), is a root of a polynomial equation $a_nx^n+a_{n-1}x^{n-1}+\cdots+a_0=0$, then identify the correct option.
   Statement A : p is a factor of a_0 and q is a factor of a_n.
   Statement B : q is a factor of a_0 and p is a factor of a_n.
   (1) both are not true (2) both are true
   (3) A is correct but B is false (4) A is incorrect but B is correct
5. A polynomial $p(x)$ of degree n is said to be a reciprocal polynomial if
   (1) either $p(x)=x^np\left(\frac{1}{x}\right)$ or $p(x)=-x^np\left(\frac{1}{x}\right)$
   (2) $p(x)=x^np\left(\frac{1}{x}\right)$ and $p(x)=-x^np\left(\frac{1}{x}\right)$
   (3) either $p(x)=p\left(\frac{1}{x}\right)$ or $p(x)=p\left(-\frac{1}{x}\right)$
   (4) $p(x)=p\left(\frac{1}{x}\right)$ and $p(x)=p\left(-\frac{1}{x}\right)$
6. Regarding Descarte's Rule, which of the following are true, where s_1, s_2 are the number of sign changes in $p(x)$ and $p(-x)$ respectively.
   (i) the number of positive zeros $> s_1$ (ii) the number of positive zeros $\leq s_1$
   (iii) the number of negative zeros $\leq s_2$ (iv) the total number of zeros $= s_1+s_2$
   (1) (ii) and (iii) only (2) (i) and (iv) (3) all (4) none

CHAPTER 4

1. e^{x} is a periodic function with period
   (1) 0 (2) π (3) 2π (4) 4π
2. $\sin^2 x + \cos x$ is
   (1) an odd function (2) an even function
   (3) neither odd nor even (4) either even or odd
3. If $y = a\sin bx$ then the amplitude and period are respectively
   (1) $a, \frac{2\pi}{b}$ (2) $|b|, \frac{2\pi}{|a|}$ (3) $|a|, \frac{2\pi}{|b|}$ (4) $b, \frac{2\pi}{a}$
4. $\sin(\sin^{-1} x) = x$ if
   (1) $|x| \le 1$ (2) $|x| \ge 1$ (3) $|x| < 1$ (4) $|x| \le \frac{\pi}{2}$
5. $\sin^{-1}(\sin x) = x$ if
   (1) $|x| \le \frac{\pi}{2}$ (2) $|x| < \frac{\pi}{2}$ (3) $|x| \ge \frac{\pi}{2}$ (4) $|x| \le 1$
6. $\cos(\cos^{-1} x) = x$ if
   (1) $|x| < 1$ (2) $|x| \le 1$ (3) $|x| \ge 1$ (4) $|x| = 0$
7. $\cos^{-1}(\cos x) = x$ if
   (1) $-\frac{\pi}{2} \le x \le \frac{\pi}{2}$ (2) $0 < x \le \pi$ (3) $0 \le x \le \pi$ (4) $-1 \le x \le 1$
8. The amplitude and period of $y = a\tan bx$ are respectively
   (1) $|a|, \frac{\pi}{|b|}$ (2) $a, \frac{\pi}{b}$ (3) not defined, $\frac{\pi}{|b|}$ (4) not defined, $\frac{\pi}{b}$
9. The domain of $\operatorname{cosec}^{-1} x$ function is
   (1) $\mathbb{R} \setminus (-1,1)$ (2) $\mathbb{R} \setminus \{-1,1\}$ (3) $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ (4) $\mathbb{R} - \{0\}$
10. The domain of secant function and $\sec^{-1} x$ function are respectively
   (1) $[0\ \pi] \setminus \left\{\frac{\pi}{2}\right\}$ and $\mathbb{R} \setminus (-1,1)$ (2) $\mathbb{Z} \setminus (-1,1)$ and $(0\ \pi] \setminus \left\{\frac{\pi}{2}\right\}$
   (3) $[0\ \pi] \setminus \left\{\frac{\pi}{2}\right\}$ and $\{-1,1\}$ (4) $\mathbb{Z} \setminus \{-1,1\}$ and $(0\ \pi] \setminus \left\{\frac{\pi}{2}\right\}$

CHAPTER 5

1. If the point (a,b) satisfies the inequality $x^2 + y^2 + 2gx + 2fy + c < 0$ then (a,b)
   (1) lies within the circle (2) lie on the circle
   (3) lie outside the circle (4) can't be determined

2. The number of tangents to the circle from inside the circle is
   (1) 2 real (2) 0 (3) 2 imaginary (4) can't be determined
3. Which of the following are correct about parabola?
   (i) axis of the parabola is axis of symmetry
   (ii) vertex is the point of intersection of the axis and the parabola
   (iii) latus rectum is a focal chord perpendicular to the axis
   (iv) length of latus rectum is 4 times the distance between focus and vertex
   (1) all (2) (i) and (ii) only (3) (iii) and (iv) only (4) (i), (ii) and (iii) only
4. For the equation $Ax^2+Bxy+Cy^2+Dx+Ey+F=0$ if $B^2-4AC=0$,
   (1) $e=1$ and represents parabola (2) $e=0$ and represents parabola
   (3) $e=1$ and represents a circle (4) $e=0$ and represents a circle
5. For the parabola $(x-h)^2=-4a(y-k)$, the equation of the directrix is
   (1) $y=k$ (2) $y=a$ (3) $x=k+a$ (4) $y=k+a$
6. For the ellipse $\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1,\ a<b$
   (1) $e=\sqrt{1-\frac{b^2}{a^2}}<1$ (2) $e=\sqrt{1-\frac{b^2}{a^2}}>1$
   (3) $e=\sqrt{1-\frac{a^2}{b^2}}<1$ (4) $e=\sqrt{1+\frac{a^2}{b^2}}<1$
7. Which of the statements are correct?
   (i) The sum of the focal distances of any point on the ellipse is equal to length of major axis.
   (ii) The difference of the focal distances of any point on the hyperbola is equal to the length of its transverse axis
   (iii) The values of a and b decide the type of ellipse.
   (iv) The values of a and b do not decide the type of the hyperbola
   (1) (i) and (ii) only (2) all (3) (i) and (iii) only (4) (i) and (iv) only
8. In the general equation $Ax^2+Bxy+Cy^2+Dx+Ey+F=0$, if $A=C=F$ and $B=D=E=0$ then the curve represents
   (1) parabola (2) hyperbola (3) circle or ellipse (4) none of the above
9. If $y=mx+c$ is a tangent to the parabola $y^2=4ax$ then the point of contact is
   (1) $\left(\frac{a}{m^2},\frac{2a}{m}\right)$ (2) $\left(\frac{-a}{m^2},\frac{2a}{m}\right)$ (3) $\left(\frac{a}{m^2},\frac{-2a}{m}\right)$ (4) $\left(\frac{-a}{m^2},\frac{-2a}{m}\right)$

10. Equation of any tangent to the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ is of the form

(1) either $y=mx+\sqrt{a^2m^2-b^2}$ or $y=mx-\sqrt{a^2m^2-b^2}$

(2) either $y=mx+\sqrt{a^2m^2-b^2}$ and $y=mx-\sqrt{a^2m^2-b^2}$

(3) either $y=mx+\sqrt{a^2m^2+b^2}$ or $y=mx-\sqrt{a^2m^2+b^2}$

(4) either $y=mx+\sqrt{a^2m^2+b^2}$ and $y=mx-\sqrt{a^2m^2+b^2}$

11. $y=mx+c$ is a tangent to the parabola $y^2=4ax$ then

(1) $c=\frac{a}{m}$ (2) $c=\frac{m}{a}$ (3) $c^2=a^2m^2+m^2$ (4) $m=c$

12. If $y=mx+c$ is a tangent to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ then

(1) $c^2=a^2m^2+b^2$ (2) $b^2=c^2+a^2m^2$ (3) $c^2=a^2m^2+m^2$ (4) $c^2=a^2m^2-b^2$

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

CHAPTER 6

1. Which one is meaningful?

(1) $(\vec{a}\times\vec{b})\times(\vec{b}\cdot\vec{c})$ (2) $\vec{a}\times(5+\vec{b})$ (3) $(\vec{a}\cdot\vec{b})\times(\vec{c}\cdot\vec{d})$ (4) $(\vec{a}\times\vec{b})\cdot(\vec{c}\times\vec{d})$

2. With usual notation which one is not equal to $\vec{a}\cdot(\vec{b}\times\vec{c})$?

(1) $-\vec{a}\cdot(\vec{c}\times\vec{b})$ (2) $\vec{c}\cdot(\vec{b}\times\vec{a})$ (3) $-\vec{b}\cdot(\vec{c}\times\vec{a})$ (4) $(\vec{c}\times\vec{a})\cdot\vec{b}$

3. Identify the correct statements.

(i) If three vectors are coplanar then their scalar triple product is 0.

(ii) If scalar triple product of three vectors is 0 then they are coplanar

(iii) If $\vec{p}=x_1\vec{a}+y_1\vec{b}+z_1\vec{c}$

$\vec{q}=x_2\vec{a}+y_2\vec{b}+z_2\vec{c}$

$\vec{r}=x_3\vec{a}+y_3\vec{b}+z_3\vec{c}$, and $\vec{a},\vec{b},\vec{c}$ are coplanar then $\vec{p},\vec{q},\vec{r}$ are coplanar

(iv) $\vec{a},\vec{b},\vec{c}$ and $\vec{d}$ are coplanar then $(\vec{a}\times\vec{b})\times(\vec{c}\times\vec{d})=\vec{0}$

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

4. The non-parametric form of vector equation of a straight line passing through a point whose position vector is $\vec{a}$ and parallel to $\vec{u}$ is

(1) $\vec{r}=\vec{a}+t\vec{u}$ (2) $\vec{r}=\vec{u}+t\vec{a}$ (3) $(\vec{r}-\vec{u})\times\vec{a}=\vec{0}$ (4) $(\vec{r}-\vec{a})\times\vec{u}=\vec{0}$

5. Which one of the following is insufficient to find the equation of a straight line?

(1) two points on the line

(2) one point on the line and direction ratios of one parallel line

(3) one point on the line and direction ratios of its perpendicular line

(4) a perpendicular line and a parallel line in Cartesian form.

6. Which of the following statement is incorrect?

(1) if two lines are coplanar then their direction ratios must be same

(2) two coplanar lines must lie in a plane

(3) skew lines are neither parallel nor intersecting

(4) if two lines are parallel or intersecting then they are coplanar

7. The shortest distance between the two skew lines $\vec{r}=\vec{a}+t\vec{u}$ and $\vec{r}=\vec{b}+t\vec{u}$ is

(1) $\dfrac{\left|(\vec{b}-\vec{a})\cdot(\vec{u}\times\vec{v})\right|}{|\vec{u}\times\vec{v}|}$ (2) $\dfrac{\left|(\vec{b}-\vec{a})\cdot(\vec{u}\times\vec{v})\right|}{\vec{u}\times\vec{v}}$

(3) $\dfrac{\left|(\vec{b}-\vec{a})\cdot(\vec{u}\times\vec{v})\right|}{|\vec{a}\times\vec{b}|}$ (4) $\dfrac{\left|(\vec{b}-\vec{a})\cdot(\vec{u}\times\vec{v})\right|}{|\vec{a}|}$

8. The non-parametric form of a vector equation passing through a point whose position vector is $\vec{a}$ and parallel to two vectors $\vec{u}$ and $\vec{v}$ is

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

9. The non-parametric form of a vector equation passing through two points whose position vectors are $\vec{a}$ and $\vec{b}$ and parallel to $\vec{u}$ is

(1) $[\vec{r}-\vec{u} \;\; \vec{b}-\vec{a} \;\; \vec{u}]=0$ (2) $[\vec{r}-\vec{a} \;\; \vec{u}-\vec{a} \;\; \vec{u}]=0$

(3) $[\vec{r}-\vec{u} \;\; \vec{b}-\vec{a} \;\; \vec{u}]=0$ (4) $[\vec{r}-\vec{a} \;\; \vec{b}-\vec{a} \;\; \vec{u}]=0$

10. Which of the following is/are false, in the case of a plane passing through three points whose position vectors are $\vec{a},\vec{b}$ and $\vec{c}$?

(i) $[\vec{r}-\vec{a} \;\; \vec{b}-\vec{a} \;\; \vec{c}-\vec{a}]=0$ (ii) $[\vec{r}-\vec{a} \;\; \vec{a}-\vec{b} \;\; \vec{c}-\vec{a}]=0$

(iii) $[\vec{r}-\vec{a} \;\; \vec{b}-\vec{a} \;\; \vec{a}-\vec{c}]=0$ (iv) $[\vec{r}-\vec{a} \;\; \vec{a}-\vec{b} \;\; \vec{a}-\vec{c}]=0$

(1) (ii) and (iii) (2) (iii) and (iv) (3) all (4) none

11. With usual notations which of the following are correct?

(i) angle between $\vec{r}\cdot\vec{n}_1 = p_1$ and $\vec{r}\cdot\vec{n}_2 = p_2$ is related by $\cos\theta = \left|\frac{\vec{n}_1\cdot\vec{n}_2}{|\vec{n}_1|\,|\vec{n}_2|}\right|$

(ii) angle between $\vec{r} = \vec{a} + t\vec{u}$ and the plane $\vec{r}\cdot\vec{n} = p$ is related by $\sin\theta = \frac{|\vec{u}\cdot\vec{n}|}{|\vec{u}|\,|\vec{n}|}$

(iii) the distance between a point with position vector $\vec{u}$ and the plane $\vec{r}\cdot\vec{n} = p$ is $\frac{|\vec{u}\cdot\vec{n} - p|}{|\vec{n}|}$

(iv) the angle between $\vec{r} = \vec{a} + s\vec{u}$ and $\vec{r} = \vec{b} + t\vec{v}$ is related by $\cos\theta = \frac{\vec{u}\cdot\vec{v}}{|\vec{u}|\,|\vec{v}|}$

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

12. Suppose you are given two lines which are lying in the required plane. In how many ways ca can find the equation of the plane?

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

13. What will be happened when finding the distance between two skew lines becomes zero?

(1) they are intersecting lines (2) they are perpendicular lines
(3) parallel lines (4) neither parallel nor intersecting

14. The shortest distance between $\vec{r} + \vec{a} + s\vec{u}$ and $\vec{r} = \vec{b} + t\vec{u}$ is

(1) $\frac{|(\vec{b}-\vec{a})\times\vec{u}|}{|\vec{u}|}$ (2) $\frac{(\vec{b}-\vec{a})\times\vec{u}}{|\vec{u}|}$ (3) $\frac{(\vec{b}-\vec{a})\times\vec{u}}{\vec{a}}$ (4) $\frac{(\vec{b}-\vec{a})\times\vec{u}}{\vec{b}}$

CHAPTER 7

1. If $ax^2 + by^2 = 1$ and $a_1x^2 + b_1y^2 = 1$ intersect each other orthogonally then which one is incorrect?

(1) $\frac{1}{a} - \frac{1}{b} = \frac{1}{a_1} - \frac{1}{b_1}$ (2) $\frac{1}{a} - \frac{1}{a_1} = \frac{1}{b} - \frac{1}{b_1}$ (3) $\frac{1}{a} + \frac{1}{b_1} = \frac{1}{b} + \frac{1}{a_1}$ (4) $\frac{1}{a} - \frac{1}{b_1} = \frac{1}{b} - \frac{1}{a_1}$

2. "Let $f(x)$ be continuous on $[a,b]$ and differentiable in (a,b). If $f(a) = f(b)$ then there exists atleast one point $c \in (a,b)$ such that $f'(c) = 0$". This statement is

(1) Intermediate value theorem (2) Rolles theorem
(3) Lagrange mean value theorem (4) Taylors theorem

3. Lagrange mean value theorem becomes Rolles theorem if

(1) $f(b) = f(a)$ (2) $f'(b) = f'(a)$ (3) $f(a) = 0$ (4) $f(b) = 0$

4. For the function $f(x) = \sin x,\ x \in \left[0, \frac{\pi}{2}\right]$, Rolles theorem is not applicable, since

(1) not continuous in $\left[0, \frac{\pi}{2}\right]$ (2) not differentiable in $\left(0, \frac{\pi}{2}\right)$

(3) $f(0) \neq f\left(\frac{\pi}{2}\right)$ (4) $f'(x)$ does not exist at $x = 0$

5. Lagrange mean value theorem, constant c for the function $y=\cos x$ in $\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$ is

(1) 1 (2) −1 (3) not exist (4) 0

6. Rolles constant c for the function $f(x)=|x|,\ x\in[-1\ \ 1]$ is

(1) 0 (2) 1 (3) −1 (4) not existing

7. The Maclaurin's series is obtained from the Taylors series by putting

(1) $x=a$ (2) $x=0$ (3) $a=0$ (4) $a=n$

8. l'H ôpital's Rule is not applicable for the limit tends to

(1) $\frac{0}{0}$ (2) $\infty-\infty$ (3) $\frac{\infty}{\infty}$ (4) 1°

9. "If $f(x)$ is continuous on $[a,b]$ then f has both absolute maximum and absolute minimum in $[a\ \ b]$". This statement is

(1) Extreme value theorem (2) Intermediate value theorem

(3) Lagrange mean value theorem (4) Taylors theorem

10. For the function $f(x)$, critical numbers are obtained by solving :

(1) $f'(x)=0$ if $f'(x)$ exists; and the values of x for which $f'(x)$ does not exist

(2) $f'(x)=0$ if $f'(x)$ does not exist; and the values for which $f'(x)$ exists

(3) $f'(x)=0$ if $f'(x)$ does not exist; and the values for which $f'(x)$ does not exist

(4) $f'(x)=0$ if $f'(x)$ exists; and the values for which $f'(x)$ exists

11. Let c be a critical number for $f(x)$ then which of the following is incorrect?

(i) $f'(x)$ changes from negative to positive through c then $f(x)$ has a local minimum

(ii) $f'(x)$ changes from positive to negative through c then $f(x)$ has a local maximum

(iii) $f''(c)$ exists and $f''(c)$ changes sign through c then $(c,f(c))$ is a point of inflection.

(iv) $f''(c)$ exists at the point of inflection then $f''(c)=0$

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

12. If c is a critical point and $f'(c)=0$, further $f''(c)$ exists then which is incorrect?

(1) f has a relative maximum at c if $f''(c)<0$

(2) f has a relative minimum at c if $f''(c)>0$

(3) $f''(c)=0$, there is no information regarding relative maxima

(4) f has a relative maximum at c if $f''(c)>0$

13. The vertical asymptote of $f(x)=\frac{1}{x}$ is

(1) $x=0$ (2) $y=0$ (3) $x=c$ (4) $y=c$

14. The horizontal asymptote of $f(x)=\frac{1}{x}$ is

(1) $y=0$ (2) $x=0$ (3) $x=c$ (4) $y=c$

15. The slant asymptote of $f(x)=\frac{x^2-6x+7}{x+5}$ is

(1) $x+y+11=0$ (2) $x+y-11=0$ (3) $x=-5$ (4) $y=x-11$

16. The vertical asymptotes of $f(x)=\frac{2x^2-8}{x^2-16}$ are

(1) $y=\pm4$ (2) does not exist (3) $x=\pm16$ (4) $x=\pm4$

17. The horizontal asymptote of $f(x)=\frac{2x^2-8}{x^2-6}$ is

(1) $x=2$ (2) $y=2$ (3) $y=\pm4$ (4) $y=4$

18. The vertical asymptotes of $f(x)=\frac{x^2}{x^2-1}$ are

(1) $x=\pm1$ (2) $y=\pm1$ (3) $x=0$ (4) $y=0$

19. The horizontal asymptote of $f(x)=\frac{x^2}{x^2-1}$ is

(1) $x=1$ (2) $x=\pm1$ (3) $y=1$ (4) $y=\pm1$

20. The vertical asymptote of $f(x)=\frac{x^2}{x+1}$ is

(1) $x=-1$ (2) $x=1$ (3) $y=1$ (4) $y=-1$

21. The slant asymptote of $f(x)=\frac{x^2}{x+1}$ is

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

22. The vertical asymptotes of $f(x)=\frac{3x}{\sqrt{x^2+2}}$

(1) x^2-2 (2) does not exist (3) $x=\sqrt{2}$ (4) $x=-\sqrt{2}$

23. The horizontal asymptotes of $f(x)=\frac{3x}{\sqrt{x^2+2}}$ are

(1) $y=\pm3$ (2) $x=\pm2$ (3) $y=\pm2$ (4) $y=0$

24. The vertical asymptote of $f(x)=\frac{x^2-6x-1}{x+3}$ is

(1) $x=-3$ (2) $x=3$ (3) does not exist (4) $x=\pm3$

25. The slant asymptote of $f(x)=\frac{x^2-6x-1}{x+3}$ is

(1) $y=x-9$ (2) $y=x+9$ (3) $x=y$ (4) $x+y=0$

26. The vertical asymptote of $f(x)=\frac{x^2+6x-4}{3x-6}$ is

(1) $x=2$ (2) $x=3$ (3) $y=2$ (4) $y=3$

27. The slant asymptote of $f(x)=\frac{x^2+6x-4}{3x-6}$ is

(1) $y=\frac{x}{3}-\frac{8}{3}$ (2) $y=\frac{x}{3}+\frac{8}{3}$ (3) $x=\frac{y}{3}+\frac{8}{3}$ (4) $y=\frac{x}{3}+8$

CHAPTER 8

1. Identify the incorrect statements

   (i) absolute error = | Actual value − app. value |

   (ii) relative error = $\frac{\text{absolute error}}{\text{actual value}}$

   (iii) percentage error = relative error ×100

   (iv) absolute error has unit of measurement but relative error and percentage errors are units free

   (1) all (2) (i) and (ii) only (3) (i), (ii), (iii) only (4) none

2. If $f(x)>0$ for all x and $g(x)=\log(f(x))$ then dg is

   (1) $\frac{1}{f(x)}f'(x)dx$ (2) $\frac{1}{x}$ (3) $\frac{1}{f(x)}dx$ (4) $\frac{1}{x}dx$

3. If f and g are differentiable functions, then $d(fg)$ is

   (1) $fdg+gdf$ (2) $f\cdot df-g\cdot dg$ (3) $f\cdot df+gdg$ (4) $fdg-gdf$

4. Let $A=\{(x,y)/x,y\in\mathbb{R}\}$ and $f:A\to\mathbb{R}^2$, $f_{xy}=f_{yx}$ only if

   (1) f_{xy},f_{yx} exist and continuous in A (2) f_x,f_y exist and continuous in A

   (3) f_{xx},f_{yy} exist and continuous in A (4) f_{xy},f_{xx} exist and continuous in A

5. Let $A=\{(x,y)/x,y\in\mathbb{R}\}$ A function $f:A\to\mathbb{R}^2$ is said to be harmonic if

   (1) $\frac{\partial^2u}{\partial x^2}+\frac{\partial^2u}{\partial y^2}=0\ \forall(x,y)\in A$ (2) $\frac{\partial^2u}{\partial x^2}-\frac{\partial^2u}{\partial y^2}=0\ \forall(x,y)\in A$

   (3) $\frac{\partial^2u}{\partial x^2}\div\frac{\partial^2u}{\partial y^2}=0\ \forall(x,y)\in A$ (4) $\frac{\partial^2u}{\partial x^2}\times\frac{\partial^2u}{\partial y^2}=0\ \forall(x,y)\in A$

6. If w is a function of x and y; and x and y are functions of t, then which of the following is undefined?

   (1) $\frac{\partial w}{\partial x}$ (2) $\frac{\partial w}{\partial y}$ (3) $\frac{\partial x}{\partial t}$ (4) $\frac{dy}{dt}$

7. If w is a function of x and y; and x and y are functions of s and t then which of following are correct?

(i) $\frac{dw}{dt}$ is not defined (ii) $\frac{dx}{ds}$ is not defined

(iii) $\frac{dy}{dt}$ is not defined (iv) $\frac{\partial w}{\partial t}=\frac{\partial w}{\partial x}\frac{\partial x}{\partial t}+\frac{\partial w}{\partial y}\frac{\partial y}{\partial t}$

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

CHAPTER 9

1. If $f(x)$ is a continuous function on $[a,b]$ and $F(x)$ is an anti derivative of $f(x)$ the second fundamental theorem of Integral Calculus $\int_a^b f(x)dx=$

(1) $F(b)-F(a)$ (2) $F'(b)-F'(a)$ (3) $F(a)-F(b)$ (4) 0

2. If $f(x)$ is a continuous function on $[a, b]$ and $F(x)=\int_a^x f(u)du,\ a<x<b$ then by fundamental theorem of integral calculus $\frac{d}{dx}F(x)=$

(1) $F'(x)$ (2) $f(x)$ (3) $f'(x)$ (4) $f(x)+c$

3. $\int_a^b f(a+b-x)dx=$

(1) $f(a)-f(b)$ (2) $\int_b^a f(x)dx$ (3) 0 (4) $\int_a^b f(x)dx$

4. $\int_0^{2a} f(x)dx=$

(1) 0 (2) $2\int_0^a f(x)dx$

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

5. If $f(2a-x)=f(x)$ then $\int_0^{2a} f(x)dx=$

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

6. If $f(2a-x)=-f(x)$ then $\int_0^{2a} f(x)dx=$

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

7. $\int_a^b [f(x)-f(a+b-x)]dx=$

(1) $f(b)(-f(a)$ (2) 0 (3) $f(b)-f(a)$ (4) 1

8. $\int_0^a \frac{f(x)}{f(x)+f(a-x)}dx=$

(1) 0 (2) a (3) $\frac{a}{2}$ (4) $2a$

9. If $I_{m,n} = \int_0^{\frac{\pi}{2}} \sin^m x \cos^n x dx$ then $I_{m,n} =$ (here $n \geq 2$)

(1) $\frac{n-1}{m+n} I_{m,n-2}$ (2) $\frac{n+1}{m+n} I_{m,n-2}$ (3) $\frac{n-1}{m+n} I_{m,n-1}$ (4) $\frac{n}{m+n} I_{m,n-2}$

10. If $I_{m,n} = \int_0^1 x^m (1-x)^n dx$ then $I_{m,n} =$ (here $n \geq 1$)

(1) $\frac{n}{m+n+1}, I_{m,n-1}$ (2) $\frac{m}{m+n+1}, I_{m,n-1}$ (3) $\frac{n}{m-n+1}, I_{m,n-1}$ (4) $\frac{n}{m+n-1}, I_{m,n-1}$

11. The values of $\int_0^\infty e^{-x} x^n dx$ and $\int_0^\infty e^{-x} x^{n-1} dx$ are respectively

(1) $m!$ and $(n-1)!$ (2) $(n+1)!$ and $(n-1)!$

(3) $n!$ and $(n-1)!$ (4) $n!$ and $(n+1)!$

CHAPTER – 10

1. Consider the statements

A : The order of a differential equation (D.E) is the highest order derivative present in the D.E

B : In the polynomial form of $D.E$., the degree of the D.E is the integral power of the highest order derivative.

Identify the correct option

(1) both are correct (2) both are false

(3) A is true, B is false (4) A is false, B is true

2. Formation of a differential equation is

(1) eliminating arbitrary constants from the given relationship by minimum number of differentiations

(2) eliminating constants from the given relationship by minimum number of differentiations

(3) eliminating arbitrary constants from the given relationship by maximum number of differentiations

(4) eliminating constants from the given relationship

3. Consider the statements :

A: The general solution of a differential equation is the solution which contains as many arbitrary constants as the order of the D.E

B: Giving particular values to the arbitrary constants in the general solution of the D.E is the particular solution.

(1) both are correct (2) both are incorrect

(3) A is correct, B is incorrect (4) A is incorrect, B is correct

4. An equation of the form $f_1(x)g_1(y)dx + f_2(x)g_2(y)dy = 0$ is called
   (1) linear differential equation
   (2) homogeneous
   (3) linear differential equation of first order
   (4) variable separable

5. A differential equation is said to be homogeneous if
   (1) $\frac{dy}{dx} = g\left(\frac{y}{x}\right)$ (2) $\frac{dy}{dx} = g(x+y)$ (3) $\frac{dy}{dx} = g(xy)$ (4) $\frac{dy}{dx} = g(x-y)$

6. A first order linear differential equation is of the form
   (1) $\frac{dy}{dx} + Py = Q$, where P and Q are functions of y
   (2) $\frac{dx}{dy} + Py = Q$, where P and Q are functions of y
   (3) $\frac{dy}{dx} + Px = Q$, where P and Q are functions of y
   (4) $\frac{dy}{dx} + Py = Q$, where P and Q are functions of x
   (or) $\frac{dx}{dy} + Px = Q$, where P and Q are functions of y

7. The integrating factor of $\frac{dy}{dx} + Py = Q$ is (P and Q are functions of x)
   (1) $e^{\int Pdy}$ (2) $e^{\int Pdx}$ (3) $e^{\int Qdy}$ (4) $e^{\int Pdx}$

8. The integrating factor of $\frac{dx}{dy} + Px + Q$ is (P and Q are functions of y)
   (1) $e^{\int Pdy}$ (2) $e^{\int Pdx}$ (3) $e^{\int Qdy}$ (4) $e^{\int Pdx}$

9. Assume that a population (x) grows or decays at a rate directly proportional to the amount population present at that time i.e. $\frac{dx}{dt} = kx$, then
   (1) $k < 0$ if it is a growth problem
   (2) $k > 0$ if it is a decay problem
   (3) $k < 0$ if it is a decay problem and $k > 0$ if it is a growth problem
   (4) $k = 0$

10. The Newtons law of cooling ($T -$ temperature of a body at any time t, T_m temperature of the surrounding medium) says
    (1) $\frac{dT}{dt} \alpha (T - T_m)$
    (2) $\frac{dT}{dt} = T - T_m$ always
    (3) $\frac{dT}{dt} = k(T - T_m), k$ is constant of proportionality
    (4) $\frac{dt}{dT} = k(T - T_m)$

11. The order and degree of the differential equation $\frac{dy}{dx} = x + y + 5$ are

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

12. The order and degree of the differential equation $\left(\frac{d^4y}{dx^4}\right)^3 + 4\left(\frac{dy}{dx}\right)^7 + 6y = 5\cos 3x$ are

(1) 12,7 (2) 4,3 (3) 3,4 (4) 7,12

13. The order and degree of the differential equation $\frac{d^2y}{dx^2} + 3\left(\frac{dy}{dx}\right)^2 = x^2 \log\left(\frac{d^2y}{dx^2}\right)$ are

(1) 2, not defined (2) 3,2 (3) 2,3 (4) 2,2

14. The order and degree of the differential equation $3\left(\frac{d^2y}{dx^2}\right) = \left[4 + \left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}}$ are

(1) $2, \frac{3}{2}$ (2) 2,2 (3) $\frac{3}{2}, 3$ (4) 3,2

15. The order and degree of the differential equation $dy + (xy - \cos x)dx = 0$ are

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

16. The order and degree of the differential equation $\frac{dy}{dx} + xy = \cot x$ are

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

17. The order and degree of the differential equation $\left(\frac{d^3y}{dx^3}\right)^{\frac{2}{3}} - 3\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 4 = 0$ are

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

18. The order and degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^2 + \left(\frac{dy}{dx}\right)^2 = x\sin\left(\frac{d^2y}{dx^2}\right)$ are

(1) 2, not defined (2) 2,2 (3) 2,1 (4) 1,2

19. The order and degree of the differential equation $\sqrt{\frac{dy}{dx}} - 4\frac{dy}{dx} - 7x = 0$ are

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

20. The order and degree of the differential equation $y\left(\frac{dy}{dx}\right) = \frac{x}{\left(\frac{dy}{dx}\right) + \left(\frac{dy}{dx}\right)^3}$ are

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

21. The order and degree of the differential equation $x^2\dfrac{d^2y}{dx^2}+\left[1+\left(\dfrac{dy}{dx}\right)^2\right]^{\frac{1}{2}}=0$ are

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

22. The order and degree of the differential equation $\left(\dfrac{d^2y}{dx^2}\right)^3=\sqrt{1+\left(\dfrac{dy}{dx}\right)}$ are

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

23. The order and degree of the differential equation $\dfrac{d^2y}{dx^2}=xy+\cos\left(\dfrac{dy}{dx}\right)$ are

(1) 2,1 (2) 1,2 (3) 2, not defined (4) 1,1

24. The order and degree of the differential equation $\dfrac{d^2y}{dx^2}+5\dfrac{dy}{dx}+\int ydx=x^3$ are

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

25. The order and degree of the differential equation $x=e^{xy\left(\frac{dy}{dx}\right)}$ are

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

26. Radium decays at a rate proportional to the amount Q present. The corresponding differential equation is (k is the constant of proportionality)

(1) $\dfrac{dQ}{dt}=k$ (2) $\dfrac{dQ}{dt}=Q$ (3) $\dfrac{dQ}{dt}=-k$ (4) $\dfrac{dQ}{dt}=kQ$

27. The population P of a city increases at a rate proportional to the product of population and the difference between 5,00,000 and the population. The corresponding differential equation (k is the constant of proportionality)

(1) $\dfrac{dP}{dt}=P(50000-P)$ (2) $\dfrac{dP}{dt}=k(50000-P)$ (3) $\dfrac{dP}{dt}=kP(500000-P)$ (4) $\dfrac{dP}{dt}=kP$

28. For a certain substance, the rate of change of vapor pressure P with respect to temperature T proportional to the vapor pressure and inversely proportional to the square of the temperature. The corresponding differential equation is (k is the constant of proportionality)

(1) $\dfrac{dP}{dT}=\dfrac{P}{T^2}$ (2) $\dfrac{dP}{dT}=k\dfrac{P}{T}$ (3) $\dfrac{dP}{dT}=k\dfrac{P}{T^2}$ (4) $\dfrac{dP}{dT}=kP$

29. A saving amount (x) pays 8% interest per year, compounded continuously. In addition, the income from another investment is credited to the amount continuously at the rate of 400 per year. Then $\dfrac{dx}{dt}=$

(1) $\dfrac{8}{100}x+400$ (2) $\dfrac{8}{100}x$ (3) $8x+400$ (4) $\dfrac{1}{100}x+400$

30. Assume that a spherical rain drop evaporates at a rate proportional to its surface area. The rate of change of the radius (r) of the rain drop $\frac{dr}{dt} =$ (k is the constant of proportionality and $k > 0$).
(1) kr (2) k (3) $-k$ (4) $-kr$

CHAPTER – 11

1. A random variable X is a function from
(1) $S \to \mathbb{R}$ (2) $\mathbb{R} \to S$ (3) $S \to \mathbb{N}$ (4) $\mathbb{N} \to S$

2. $X : S \to \mathbb{R}$ is said to be discrete random variable if
(1) range of X is countable (2) range of X is uncountable
(3) range of X is $\mathbb{N}$ (4) range of X is $\mathbb{R}$

3. $P[X = x_k], k = 1, 2, \cdots n$ is called a probability mass function if
(1) $P[X = x_k] \geq 0$ and $\sum_k P[X = x_k] = 1$ (2) $P[X = x_k] > 0$ and $\sum_k P[X = x_k] = 1$
(3) $P[X = x_k] = 0$ and $\sum_k P[X = x_k] = 1$ (4) $P[X = x_k] \geq 0$ and $\sum_k P[X = x_k] = 0$

4. Let X be a discrete random variable and taking the values $x_1, x_2 \cdots x_n$ with $p.m.f$ $P[X = x_k]$. The cumulative distribution function $F(x)$ is defined as
(1) $P[X \leq x]$ (2) $1 - P[X \leq x]$ (3) $P[X < x]$ (4) $1 - P[X < x]$

5. Which of the following are true in the case of $c.d.f$ $F(x)$? (X is a discrete random variable)
(i) $0 \leq F(x) \leq 1$ (ii) $\lim_{x \to -\infty} F(x) = 0$ and $\lim_{x \to \infty} F(x) = 1$
(iii) $P[x_1 < X \leq k_2] = F(x_2) - F(x_1)$ (iv) $P[X > x] = 1 - P[X \leq x] = 1 - F(x)$
(1) (i) and (iv) only (2) (ii),(iii),(iv) only
(3) (i), (ii), (iii) only (4) all

6. Let X be a continuous random variable. The function $f(x)$ is said to be a $p.d.f$ if
(1) $f(x) > 0$ and $\int_a^b f(x)dx = 0$ (2) $f(x) \geq 0$ and $\int_a^b f(x)dx = 1$
(3) $f(x) > 0$ and $\int_a^b f(x)dx = 1$ (4) $f(x) \geq 0$ and $\int_a^b f(x)dx = 0$

7. For a continuous random variable, which of the following is/are incorrect?
(i) $P[X = x] = 0$ and $P[a < X < b] = F(b) - F(a)$
(ii) $P[X = x] = 1$ and $P[a < X < b] = F(b) - F(a)$
(iii) $P[X = x] = 0$ and $P[a \leq X \leq b] = P[a < X < b]$
(iv) $P[a < X < b] = P[a \leq X < b] = P[a < X \leq b]$ and $P[X = x] = 0$
(1) (ii) and (iii) only (2) (ii) only (3) (i) and (ii) only (4) (iv) only

8. With usual notations, which of the following are correct?

(i) $Var(X) = E(X^2) - [E(X)]^2$

(ii) $Var(aX + b) = a^2 Var(X)$

(iii) $E(aX + b) = aE(X) + b$

(iv) $E(X) = \int_{-\infty}^{\infty} f(x)dx$ if X is continuous

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

9. If X is a Bernoulli's random variable which follows Bernoulli's distribution with parameter then

(1) $\mu = p, \sigma = pq$ (2) $\mu = pq, \sigma = p$ (3) $\mu = pq, \sigma = q$ (4) $\mu = p, \sigma^2 = pq$

10. If $X \sim B(n, p)$ then

(1) $\mu = np, \sigma^2 = np(1-p)$ (2) $\mu = nq, \sigma = np(1-p)$

(3) $\mu = np, \sigma = np(1-p)$ (4) $\mu = npq \ \sigma = npq$

CHAPTER 12

1. Which of the following is not a binary operation on $\mathbb{R}$?

(1) + (2) − (3) ÷ (4) ×

2. The operation '−' is binary on

(1) $\mathbb{N}$ (2) $Q \setminus \{0\}$ (3) $\mathbb{R} \setminus \{0\}$ (4) Q

3. The operation '÷' is binary on

(1) $\mathbb{R} \setminus \{0\}$ (2) $\mathbb{C}$ (3) $\mathbb{R}$ (4) $\mathbb{Z}$

4. The additive inverse do not exists for some elements in the set

(1) $\mathbb{R}$ (2) $-1 \le x \le 2$ (3) $\mathbb{Z}$ (4) Q

5. The multiplicative inverse exists for each element in the set

(1) $-2 \le x \le 2$ (2) $\mathbb{Z}$ (3) $\mathbb{R} \setminus \{0\}$ (4) $\mathbb{C}$

6. The identity element under addition exists in

(1) $\mathbb{N}$ (2) $\mathbb{C} \setminus \{0\}$ (3) $(0 \ \ \infty)$ (4) $-3 \le x \le 3$

7. The properties closure, associative, identity, inverse and commutative under addition satisfy the set

(1) $\mathbb{R}$ (2) $\mathbb{N}$ (3) $\{1, -1, 0\}$ (4) $Q \setminus \{0\}$

8. The fourth roots of unity under multiplication satisfies the properties

(1) closure only (2) closure and associative only

(3) closure, associative and identity (4) closure, associative identity and inverse

9. Which one of the following is correct?
(1) $[3]+_4[2]=[5]$
(2) $[0]+_{10}[12]=[0]$
(3) $[4]\times_5[3]=[12]$
(4) $[5]\times_6[4]=[2]$

10. Which of the following is not true?
(1) A Boolean matrix is a real matrix whose entries are either 0 or 1
(2) The product $\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}\begin{bmatrix}0 & 1\\1 & 0\end{bmatrix}$ is a Boolean matrix
(3) All identity matrices I_n are Boolean matrices
(4) $\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}\vee\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}=\begin{bmatrix}2 & 0\\0 & 2\end{bmatrix}$

Chapter – 1

Qn.No.	1	2	3	4	5	6	7	8	9	10
Key	(4)	(1)	(2)	(1)	(4)	(3)	(4)	(1)	(2)	(4)

Chapter – 2

Qn.No.	1	2	3	4	5	6	7	8	9	10
Key	(1)	(2)	(1)	(3)	(1)	(4)	(3)	(1)	(3)	(1)

Chapter – 3

Qn.No.	1	2	3	4	5	6				
Key	(1)	(3)	(4)	(3)	(1)	(1				

Chapter – 4

Qn.No.	1	2	3	4	5	6	7	8	9	10
Key	(3)	(2)	(3)	(1)	(1)	(2)	(1)	(3)	(1)	(1)

Chapter – 5

Qn.No.	1	2	3	4	5	6	7	8	9	10
Key	(1)	(3)	(1)	(1)	(4)	(3)	(2)	(4)	(1)	(1)
Qn.No.	11	12	13							
Key	(1)	(1)	(3)							

Chapter – 6

Qn.No.	1	2	3	4	5	6	7	8	9	10
Key	(4)	(3)	(2)	(4)	(4)	(1)	(1)	(2)	(4)	(3)
Qn.No.	11	12	13	14						
Key	(1)	(4)	(1)	(1)						

Chapter – 7

Qn.No.	1	2	3	4	5	6	7	8	9	10
Key	(4)	(2)	(1)	(3)	(4)	(4)	(3)	(4)	(1)	(1)
Qn.No.	11	12	13	14	15	16	17	18	19	20
Key	(1)	(4)	(1)	(1)	(4)	(4)	(2)	(1)	(3)	(1)
Qn.No.	21	22	23	24	25	26	27			
Key	(2)	(2)	(1)	(1)	(1)	(1)	(2)			

Chapter – 8

Qn.No.	1	2	3	4	5	6	7			
Key	(4)	(1)	(1)	(1)	(1)	(3)	(1)			

Chapter – 9

Qn.No.	1	2	3	4	5	6	7	8	9	10
Key	(1)	(2)	(2)	(4)	(1)	(3)	(2)	(3)	(1)	(1)
Qn.No.	11									
Key	(3)									

Chapter – 10

Qn.No.	1	2	3	4	5	6	7	8	9	10
Key	(1)	(1)	(1)	(4)	(1)	(4)	(4)	(1)	(3)	(3)
Qn.No.	11	12	13	14	15	16	17	18	19	20
Key	(4)	(2)	(1)	(2)	(1)	(1)	(4)	(1)	(3)	(1)
Qn.No.	21	22	23	24	25	26	27	28	29	30
Key	(2)	(1)	(3)	(4)	(1)	(4)	(3)	(3)	(1)	(3)

Chapter – 11

Qn.No.	1	2	3	4	5	6	7	8	9	10
Key	(1)	(1)	(1)	(1)	(4)	(2)	(2)	(2)	(4)	(1)

Chapter – 12

Qn.No.	1	2	3	4	5	6	7	8	9	10
Key	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(4)	(4)	(4)

XII STANDARD MATHEMATICS

APPLICATIONS OF MATRICES AND DETERMINANTS

Choose the correct or the most suitable answer from the given four alternatives.

(1)If a matrix A is orthogonal then which of the following is/are true?

(i) $A^{-1}A^{T}=I$ (i) $AA^{T}=I$ (iii) $A^{T}A^{T}=I$ (iv) $A^{-1}=A^{T}$

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

(2)If $\frac{1}{|A|}=(AB)=I$, $|A|\neq 0$ and I is the unit matrix, then the matrix B is the

(1) inverse of A (2) transpose of A

(3) adjoint of A (4) cofactor matrix of A

(3) If $A=\begin{pmatrix}1 & -2\\ 3 & 4\end{pmatrix}$, then $|A|(\text{adj} A)$ is

(1) $\begin{pmatrix}4 & 2\\ -3 & 1\end{pmatrix}$ (2) $\begin{pmatrix}1 & -2\\ 3 & 4\end{pmatrix}$ (3) $\frac{1}{10}\begin{pmatrix}4 & 2\\ -3 & 1\end{pmatrix}$ (4) $100\begin{pmatrix}1 & -2\\ 3 & 4\end{pmatrix}$

(4) If A is a square matrix such that $A^{3}=I$, then $A^{-1}=$

(1) A (2) A^{2} (3) A^{3} (4) A^{4}

(5) If A is an orthogonal matrix then

(1) $|A|=\pm 2$ (2) $|A|=0$ (3) $|A|=\pm 1$ (4) $|A|=\pm 3$

(6) If $A=\begin{bmatrix}a & 0 & 0\\ 0 & b & 0\\ 0 & 0 & c\end{bmatrix}$, then $A^{-1}=$

(1) $\begin{bmatrix}\frac{1}{b} & 0 & 0\\ 0 & \frac{1}{c} & 0\\ 0 & 0 & \frac{1}{a}\end{bmatrix}$ (2) $\begin{bmatrix}\frac{1}{a} & 0 & 0\\ 0 & \frac{1}{b} & 0\\ 0 & 0 & \frac{1}{c}\end{bmatrix}$ (3) $\begin{bmatrix}0 & 0 & \frac{1}{a}\\ 0 & \frac{1}{b} & 0\\ \frac{1}{c} & 0 & 0\end{bmatrix}$ (4) $\begin{bmatrix}0 & 0 & \frac{1}{b}\\ 0 & \frac{1}{c} & 0\\ \frac{1}{a} & 0 & 0\end{bmatrix}$

(7) If $A=\begin{bmatrix}2 & 3 & 4\end{bmatrix}$ then rank of AA^{T} is

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

(8)If $\frac{a_1}{x}+\frac{b_1}{y}=d_1$, $\frac{a_2}{x}+\frac{b_2}{y}=d_2$

$\Delta_1=\begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix}$, $\Delta_2=\begin{vmatrix} a_1 & d_1 \\ a_2 & d_2 \end{vmatrix}$ and $\Delta_3=\begin{vmatrix} d_1 & b_1 \\ d_2 & b_2 \end{vmatrix}$, then x and y are respectively

(1) $\frac{\Delta_1}{\Delta_2}$ and $\frac{\Delta_1}{\Delta_3}$ (2) $\frac{\Delta_2}{\Delta_3}$ and $\frac{\Delta_1}{\Delta_2}$ (3) $\frac{\Delta_3}{\Delta_1}$ and $\frac{\Delta_2}{\Delta_1}$ (4) $\frac{\Delta_2}{\Delta_1}$ and $\frac{\Delta_3}{\Delta_1}$

(9)If a,b,c are positive real numbers then the following system of equations in x,y and z,

$\frac{x^2}{a^2}+\frac{y^2}{b^2}-\frac{z^2}{c^2}=1$, $\frac{x^2}{a^2}-\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$, $\frac{-x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$ has

(1) infinitely many solutions (2) finitely many solutions

(3) no solution (4) unique solution

(10)If the system of equations $ax+y+z=0$, $x+by+z=0$, $x+y+cz=0$, (where $a\neq 1, b\neq 1, c\neq 1$) has a non-trivial solution, then the value of $\frac{a}{1-a}+\frac{b}{1-c}+\frac{c}{1-c}=$

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

(11) If $|A|\neq 0$, then which of the following is not true?

(1) $(A^2)^{-1}=(A^{-1})^2$ (2) $(A^T)^{-1}=(A^{-1})^T$

(3) $A^{-1}=|A|^{-1}$ (4) $(\text{adj } A)^T=(\text{adj } A^T)$

(12) If A is an invertible square matrix and k is a non-negative real number, then $(kA)^{-1}=$

(1) kA^{-1} (2) $\frac{1}{k}k^{-1}$ (3) $-kA^{-1}$ (4) $-\frac{1}{k}A^{-1}$

(13) If $A=\begin{bmatrix} 3 & 4 & 5 \\ -6 & 2 & -3 \\ 8 & 1 & 7 \end{bmatrix}$ then $|A^{-1}|=$

(1) 13 (2) $\frac{1}{13}$ (3) -13 (4) $\frac{-1}{13}$

(14) If A is a non-singular matrix and $A^2-2A+2I=0$ then $A^{-1}=$

(1) $I-A$ (2) $\frac{1}{2}(I+A)$ (3) $I+A$ (4) $\frac{1}{2}(I-A)$

(15) If $A=\begin{bmatrix} 3 & 1 \\ 7 & 5 \end{bmatrix}$ and $A^2+xI=yA$, then the values of x and y are respectively

(1) 6,4 (2) 8,6 (3) (3,8) (4) (5,8)

XII STANDARD MATHEMATICS

Complex Numbers

Choose the correct or the most suitable answer from the given four alternatives.

(1)Which of the following is not true?

(1) $i^4=1$ 2) $\frac{1}{i^3}-i=0$ (3) $\frac{1}{i}+i^3=0$ (4) $\frac{1}{i^2}=i^2$

(2)Which of the following statement is not true?

(1) $\frac{z}{\bar{z}}$ is real (2) $z+\bar{z}$ is real

(3) $z-\bar{z}$ is purely imaginary (4) $z\bar{z}$ is real

(3)If $z=\frac{3+4i}{2-3i}$, the complex number ω which satisfies the equation $z\omega=1$ is

(1) $\omega=\frac{6+17i}{25}$ (2) $\omega=\frac{-6-17i}{25}$ (3) $\omega=\frac{-6+17i}{5}$ (4) $\omega=\frac{6+17i}{5}$

(4)The set of points for which $|z-2+3i|=4$ is a circle with

(1) centre $-2+3i$, radius 4 (2) centre $2-3i$, radius 2

(3) centre $2-3i$, radius 4 (4) centre $-2+3i$, radius 2

(5)The complex number $3\left(\cos\frac{5\pi}{6}+i\sin\frac{5\pi}{6}\right)$ is equal to

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

(6)The modulus and principal argument of the complex number $z=-2(\cos\theta-i\sin\theta)$ $\left(\text{where } 0<\theta\le\frac{\pi}{2}\right)$ are, respectively,

(1) $2,-\theta$ (2) $2,\pi-\theta$ (3) $-2,\theta$ (4) $2,-\pi+\theta$

(7)The value of $\left(\sqrt{3}-i\right)^6$ is

(1) 2^6 (2) -2^6 (3) $i2^6$ (4) $-i2^6$

(8)If $x+iy=\left(-1+i\sqrt{3}\right)^{2019}$, then x is

(1) 2^{2019} (2) -2^{2019} (3) -1 (4) 1

(9)If $\omega\ne1$ is the cubic root of unity then $\frac{a+b\omega+c\omega^2}{a\omega^2+b+c\omega}+\frac{a\omega^2+b\omega+c}{a+b\omega^2+c\omega}$ is

(1) 1 (2) -1 (3) ω (4) $-\omega$

XII STANDARD MATHEMATICS

THEORY OF EQUATIONS

Choose the correct or the most suitable answer from the given four alternatives.

(1) If α,β,γ are the roots of the equation $x^3+ax^2+bx+c=0$. The value of $(1+\alpha)(1+\beta)(1+\gamma)$ is

(1) $(1+b)-(a+c)$ (2) $(1-b)+(a-c)$ (3) $(1-b)-(a-c)$ (4) $(1+b)+(a+c)$

(2) $2x^3-x^2-2x+2=Q(x)(2x-1)+R(x)$ for all values of x. The value of $R(x)$ is

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

(3) Roots of $x^3+x^2-4x-4=0$ is

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

(4) The value of x that satisfies $f(x)=0$ is called the

(1) root of an equation $f(x)=0$ (2) root of a function $f(x)$

(3) zero of an equation $f(x)=0$ (4) none of the above

(5) A monic polynomial which crosses the x-axis at $-4,0$, and 2; lies below the x-axis between -4 and 0; lies above the x-axis between 0 and 2 is

(1) x^3+2x^2-8x (2) x^3-2x^2-8x (3) $-x^3-2x^2+8x$ (4) $-x^3+2x^2+8x$

(6) A monic polynomial touches the x-axis at 0 and crosses the x-axis at 3; lies above the x-axis between 0 and 3.

(1) $-x^3-3x^2$ (2) x^3+3x^2 (3) x^3-3x^2 (4) $-x^3+3x^2$

(7) The list of all possible rational roots for x^5-4x^2+6x+5

(1) $\pm1,\pm5$ (2) $\pm5,\pm\frac{1}{5}$ (3) $\pm1,\pm\frac{1}{5}$ (4) $\pm\frac{1}{4},\pm\frac{5}{4},\pm5$

(8) The list of all possible rational roots for $7x^3-x^2+3$

(1) $\pm\frac{1}{7},\pm\frac{3}{7},\pm1,\pm3$ (2) $\pm\frac{1}{7},\pm\frac{1}{3},\pm1,\pm3,\pm7$

(3) $\pm\frac{1}{7},\pm\frac{3}{7},\pm1,\pm3,\pm7$ (4) $\pm\frac{1}{3},\pm\frac{7}{3},\pm1,\pm7$

(9) The list of all possible rational roots for $6x^4+3x^3-3x^2+3x-5$

(1) $\pm1,\pm2,\pm3,\pm6,\pm\frac{1}{2},\pm\frac{5}{2},\pm\frac{1}{3},\pm\frac{5}{3},\pm\frac{1}{6},\pm\frac{5}{6}$ (2) $\pm1,\pm5,\pm\frac{1}{5},\pm\frac{2}{5},\pm\frac{3}{5},\pm\frac{6}{5}$

(3) $\pm1,\pm5,\pm\frac{1}{2},\pm\frac{5}{2},\pm\frac{1}{3},\pm\frac{5}{3},\pm\frac{1}{6},\pm\frac{5}{6}$ (4) $\pm1,\pm2,\pm3,\pm6,\pm\frac{1}{5},\pm\frac{2}{5},\pm\frac{3}{5},\pm\frac{6}{5}$

(10) The list of all possible rational roots for $3x^4+7x^3-3x^2+5x-12$

(1) $\pm1,\pm3,\pm\frac{1}{2},\pm\frac{3}{2},\pm\frac{1}{3},\pm\frac{1}{4},\pm\frac{3}{4},\pm\frac{1}{6},\pm\frac{1}{12}$

(2) $\pm1,\pm2,\pm3,\pm4,\pm6,\pm12,\pm\frac{1}{2},\pm\frac{3}{2},\pm\frac{1}{3},\pm\frac{1}{4},\pm\frac{3}{4},\pm\frac{1}{6},\pm\frac{1}{12}$

(3) $\pm1,\pm2,\pm3,\pm4,\pm6,\pm12,\pm\frac{1}{3},\pm\frac{2}{3},\pm\frac{4}{3}$

(4) $\pm1,\pm2,\pm3,\pm6,\pm12,\pm\frac{1}{3},\pm\frac{2}{3},\pm\frac{3}{4}$

(11) Using Descartes Rule of Signs, the possible number of positive and negative real zeros of $P(x)=6x^5-4x^2+x+4$

(1) 3 or 1 positive zeros, 3 or 1 negative zeros
(2) 2 or 0 positive zeros, 1 or 0 negative zeros
(3) 2 or 0 positive zeros, 2 or 0 negative zeros
(4) 2 or 0 positive zeros, 1 negative zero

(12) Using Descartes Rule of Signs, the possible number of positive and negative real zeros of $P(x)=6x^8-9x^7+x^6-3x+18$

(1) 4, 2 or 0 positive zeros, no negative zeros
(2) 4 or 2 positive zeros, no negative zeros
(3) 4 positive zeros, no negative zeros
(4) 4, 2 or 0 positive zeros, 1 negative zero

(13) Using Rational root theorem, the zeros of the polynomial $3x^3-x^2-9x+3$ is

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

(14) Using Rational root theorem, the zeros of the polynomial $x^4+3x^3-5x^2-9x-2$ is

(1) $1,-2,-2+\sqrt{3},-2-\sqrt{3}$ (2) $-1,3,-2+\sqrt{5},-2-\sqrt{5}$
(3) $-1,2,-2+\sqrt{3},-2-\sqrt{3}$ (4) $-1,-2,-2+\sqrt{5},-2-\sqrt{5}$

(15) Using Rational root theorem, the zeros of the polynomial $2x^4-17x^3+59x^2-83x+39$ is

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

(16) If $x+x^2+x^3=2+2^2+2^3$ then the roots of the equation are

(1) $2, -1-\sqrt{6}i, -1+\sqrt{6}i$ (2) $2, -\frac{3}{2}-i\frac{\sqrt{15}}{2}, -\frac{3}{2}-i\frac{\sqrt{15}}{2}$

(3) $2, -\frac{3}{2}+i\frac{\sqrt{19}}{2}, -\frac{3}{2}-i\frac{\sqrt{19}}{2}$ (4) $2, -1+\sqrt{6}i, -1-\sqrt{6}i$

(17) If a, b, c are the roots of $x^3 - px^2 + qx - r = 0$, find the value of $(a+b-c)(b+c-a)(c+a-b)$:

(1) $p^3 - 8r$ (2) $4pq - p^3$ (3) $4pq - p^3 - 8r$ (4) $4pq - 8r$

(18) If $x = -1$ is a zero with multiplicity 2 of the polynomial $P(x) = x^4 + x^3 + x^2 + kx + k - 1$, then value of k is

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

(19) According to Descartes Rules of Signs, the number of possible positive and negative real zeros of the polynomial $P(x) = 5x^4 + x^3 + 3x^2 - 3x - 1$ are

(1) one positive and three negative zeros
(2) one positive and either three or one negative zeros
(3) one positive and one negative zeros
(4) one negative and either three or one positive zeros

(20) A polynomial $P(x)$ of lowest degree and real coefficient that has zeros 0 (of multiplicity 3), $2i$, and i is

(1) $P(x) = x^7 + 9x^5 + 4x^3$ (2) $P(x) = x^7 + 5x^5 + 4x^3$

(3) $P(x) = x^7 + 5x^5 + 11x^3$ (4) $P(x) = x^5 - 3ix^4 - 2x^3$

XII STANDARD MATHEMATICS

INVERSE TRIGONOMETRIC FUNCTIONS

Choose the correct or the most suitable answer from the given four alternatives.

(1) The principal value of $\sin\left(\cot^{-1}\left(\cot\frac{17\pi}{3}\right)\right)$ is equal to

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

(2) The value of $\tan\left(\frac{1}{2}\sin^{-1}\frac{3}{4}\right)$ is

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

(3) The range of the function $\sin\left(\sin^{-1}x+\cos^{-1}x\right)$, $|x|\le 1$ is

(1) $[-1,1]$ (2) $(-1,1)$ (3) $\{0\}$ (4) $\{1\}$

(4) If $4\sin^{-1}x+\cos^{-1}x=\pi$, then the value of x is

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

(5) The value of $\cos^{-1}(\cos 12)-\sin^{-1}(\sin 12)$ is

(1) 0 (2) π (3) $8\pi-24$ (4) $9\pi+24$

(6) If $\theta=\sin^{-1}x+\cos^{-1}x-\tan^{-1}x$, $x\ge 0$, then the smallest interval in which θ lies is, given by

(1) $\frac{\pi}{4}\le\theta\le\frac{\pi}{2}$ (2) $0\le\theta\le\frac{\pi}{4}$ (3) $\frac{\pi}{2}\le\theta\le\frac{3\pi}{4}$ (4) $-\frac{\pi}{4}\le\theta\le 0$

(7) If $\cos^{-1}x=\tan^{-1}x$, then $\sin\left(\cos^{-1}x\right)$ is

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

(8) $\tan^{-1}\left(\frac{\cos x}{1+\sin x}\right)=$

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

(9) If $\cos^{-1}p+\cos^{-1}q+\cos^{-1}r=\pi$, then $p^2+q^2+r^2+2pqr=$

(1) 0 (2) $\frac{\pi}{4}$ (3) $\frac{\pi}{3}$ (4) $\frac{\pi}{6}$

(10)If $x^2+y^2+z^2=r^2$, then $\tan^{-1}\left(\frac{xy}{zr}\right)+\tan^{-1}\left(\frac{yz}{xr}\right)+\tan^{-1}\left(\frac{xz}{yr}\right)=$

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

(11)If $a\le\tan^{-1}x+\cot^{-1}x+\sin^{-1}x\le b$, then the values of a and b is

(1) $a=0,\ b=\frac{\pi}{4}$ (2) $a=\frac{\pi}{4},\ b=\pi$ (3) $a=0,\ b=\pi$ (4) $a=\frac{\pi}{2},\ b=\pi$

(12)If $\cos^{-1}x+\cos^{-1}y+\cos^{-1}z=3\pi$, then $x^{1001}+y^{1002}+z^{1003}-3$ is equal to

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

(13)If $A=\tan^{-1}x,\ x\in\mathbb{R}$, then the value of $\sin 2A$ is

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

(14)If $0\le x<\infty$, then $\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)$ equals

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

(15)If $\sin^{-1}\left(\frac{2x}{1+x^2}\right)+\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)=4\tan^{-1}x$, then

(1) $x\in[1,\infty)\cup(-\infty,-1)$ (2) $x\in[-1,1]$ (3) $x\in[1,\infty)$ (4) $x\in(-\infty,-1)$

(16)If $\sec^{-1}x=\operatorname{cosec}^{-1}y$, then $\cos^{-1}\frac{1}{x}+\cos^{-1}\frac{1}{y}$ is

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

(17)The equation $\sin^{-1}x-\cos^{-1}x=\cos^{-1}\frac{\sqrt{3}}{2}$ has

(1) no solution (2) unique solution

(3) infinite number of solutions (4) finite number of solutions.

(18)The complete set of solutions $\sin^{-1}(\sin 5)>x^2-4x$ is

(1) $|x-2|<\sqrt{9-2\pi}$ (2) $|x-2|>\sqrt{9-2\pi}$

(3) $|x|<\sqrt{9-2\pi}$ (4) $|x|>\sqrt{9-2\pi}$

(19) The value of $\tan^{-1}(\tan(-6))$ is

(1) $\pi - 6$ (2) $2\pi - 6$ (3) $\pi + 6$ (4) $2\pi + 6$

(29)If x satisfies the in equation $x^2 - x - 2 > 0$. then a value exists for

(1) $\sin^{-1} x$ (2) $\sec^{-1} x$ (3) $\cos^{-1} x$ (4) none of these

XII STANDARD MATHEMATICS

TWO DIMENSIONAL ANALYTICAL GEOMETRY-II

Choose the correct or the most suitable answer from the given four alternatives.

(1) The vertices of the ellipse $\frac{(x-1)^2}{9}+\frac{(y-2)^2}{18}=1$ are

(1) $(3,4)$ and $(-3,4)$ (2) $(4,3)$ and $(-4,3)$
(3) $(5,2)$ and $(-3,2)$ (4) $(1,6)$ and $(1,-2)$

(2) The line PP^1 is a focal chord of the parabola $y^2=8x$ and if the coordinates of P are $(18,12)$ then the coordinates of P' is

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

(3) The equations $4y^2-50x=25x^2+16y+109$ represents

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

(4) The ellipse $x^2+4y^2=4$ is inscribed in a rectangle aligned with coordinate axes which inturn inscribed in another ellipse through the point $(4,0)$. Then the equation of the ellipse is

(1) $x^2+16y^2=16$ (2) $x^2+12y^2=16$ (3) $4x^2+48y^2=48$ (4) $4x^2+64y^2=48$

(5) The eccentricity of an ellipse, with its centre at the origin is $\frac{1}{2}$. If one of the directrices is $x=4$, then the equation of the ellipse is

(1) $x^2+4y^2=1$ (2) $3x^2+4y^2=12$ (3) $4x^2+3y^2$ (4) $4x^2+3y^2=1$

(6) The locus of a point $P(\alpha,\beta)$ moving under the condition that the line $y=\alpha x+\beta$ is a tangent to the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ is

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

(7) For the hyperbola $\frac{x^2}{\cos^2\alpha}-\frac{y^2}{\sin^2\alpha}=1$. Which of the following remains constant when α reverses

.

(1) eccentricity (2) directrix
(3) abseissae of vertices (4) abseissae of coci

(8) A focus of an ellipse is at the origin. The directrix is the line $x=4$ and the eccentricity is $\frac{1}{2}$. Then the length of the semi-major axis is

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

(9)The radius of the auxiliary circle of the conic $9x^2+16y^2=144$ is

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

(10)Find the equation of the circle whose diameter is the chord $x+y=1$ of the circle $x^2+y^2=4$.

(1) $x^2+y^2-x-y-3=0$ (2) $x^2+y^2+x+y-3=0$

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

(11)If $x+y=k$ is normal to $y^2=12x$, then k is

(1) 3 (2) 9 (3) -9 (4) -3

(12)The radius of the circle passing through the foci of the ellipse $\frac{x^2}{16}+\frac{y^2}{9}=1$ and having its centre at $(0,3)$ is

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

(13)The locus of the point of intersection of two perpendicular tangents to the ellipse $\frac{x^2}{16}+\frac{y^2}{9}=1$

(1) $x^2+y^2=9$ (2) $x^2+y^2=16$ (3) $x^2+y^2=25$ (4) $x^2+y^2=4$

(14)The number of tangents that can be drawn from the point $(4,3)$ to the hyperbola $\frac{x^2}{4}-\frac{y^2}{3}=1$ is

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

(15)If the line $y=3x+\lambda$ and touch the hyperbola $9x^2-5y^2=45$, then the value of λ is

(1) ± 3 (2) ± 2 (3) ± 6 (4) $\pm\sqrt{5}$

XII STANDARD MATHEMATICS

APPLICATIONS OF VECTOR ALGEBRA

Choose the correct or the most suitable answer from the given four alternatives.

(1)If $\vec{a}$ is a vector perpendicular to both $\vec{b}$ and $\vec{c}$, then

(1) $\vec{a}+\vec{b}+\vec{c}=\vec{0}$ (2) $\vec{a}\cdot(\vec{b}\times\vec{c})=0$

(3) $\vec{a}\times(\vec{b}\times\vec{c})=\vec{0}$ (4) $\vec{a}\times(\vec{b}+\vec{c})=\vec{0}$

(2)If $\vec{a},\vec{b},\vec{c}$ are any three vectors such that $(\vec{a}+\vec{b})\cdot\vec{c}=(\vec{a}-\vec{b})\cdot\vec{c}$, then $(\vec{a}\times\vec{b})\times\vec{c}$ is

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

(3)If $\vec{a}=\hat{i}+\hat{j}+\hat{k}$, $\vec{b}=-\hat{i}+2\hat{j}-4\hat{k}$ and $\vec{c}=2\hat{i}+3\hat{j}-\hat{k}$, then $(\vec{a}\times\vec{b})\cdot(\vec{a}\times\vec{c})$ is equal to

(1) -36 (2) 64 (3) -64 (4) 36

(4)The vector $\vec{a}\times(\vec{b}\times\vec{c})$ is coplanar with the vectors

(1) $\vec{a},\vec{c}$ (2) $\vec{a},\vec{b}$ (3) $\vec{b},\vec{c}$ (4) $\vec{a},\vec{b},\vec{c}$

(5)A particle is acted on by a force of magnitude 5 units in the direction $2\hat{i}-2\hat{j}+\hat{k}$ and is displaced from $(2,3,4)$ to $(6,4,8)$, then the work done by the force is

(1) $\frac{50}{7}$ (2) $\frac{50}{3}$ (3) $\frac{25}{3}$ (4) $\frac{25}{7}$

(6)The torque of the force $\vec{F}=3\hat{i}+2\hat{j}-4\hat{k}$ about the point $(2,-1,3)$ acting through a point $(1,-1,2)$ is

(1) $2\hat{i}-7\hat{j}-2\hat{k}$ (2) $2\hat{i}+7\hat{j}-2\hat{k}$

(3) $-2\hat{i}-\hat{j}+2\hat{k}$ (4) $-2\hat{i}-7\hat{j}+2\hat{k}$

(7)A vector perpendicular to $2\hat{i}+\hat{j}+\hat{k}$ and coplanar with $\hat{i}+2\hat{j}+\hat{k}$ and $\hat{i}+\hat{j}+2\hat{k}$ is

(1) $5(\hat{j}-\hat{k})$ (2) $5(\hat{j}+\hat{k})$ (3) $\hat{i}+7\hat{j}-\hat{k}$ (4) $\hat{i}+7\hat{j}+\hat{k}$

(8)If the straight line $\frac{x-3}{4}=\frac{y-4}{7}=\frac{z+3}{-13}$ lies in the plane $5x-y+z=p$, then the value of p is

(1) 2 (2) -3 (3) 8 (4) 9

(9)If the lines $\frac{x-1}{2}=\frac{y+1}{3}=\frac{z-1}{4}$ and $\frac{x-3}{1}=\frac{y-k}{2}=z$ intersect, then the value of k is

(1) $\frac{9}{2}$ (2) $-\frac{2}{9}$ (3) $\frac{3}{2}$ (4) $-\frac{2}{3}$

(10)The equation of plane through the intersection of the planes $x+2y+3z-4=0$ and $4x+3y+2z+1=0$, and passing through the origin is

(1) $7x+4y+z=0$ (2) $17x+14y+11z=0$
(3) $7x+y+4z=0$ (4) $17x+14y+z=0$

(11)If the planes $\vec{r}\cdot(3\hat{i}-2\hat{j}+2\hat{k})=17$ and $\vec{r}\cdot(4\hat{i}+3\hat{j}-m\hat{k})=25$ are perpendicular, then the value of m is

(1) 3 (2) -3 (3) 9 (4) -9

(12)The non parametric form of the vector equation of the plane passing through $(3,4,5)$ and parallel to the plane $x+2y+4z=5$ is

(1) $\vec{r}\cdot(\hat{i}+2\hat{j}+4\hat{k})=24$ (2) $\vec{r}\cdot(\hat{i}+2\hat{j}+4\hat{k})=31$
(3) $\vec{r}\cdot(\hat{i}+2\hat{j}+4\hat{k})=42$ (4) $\vec{r}\cdot(\hat{i}+2\hat{j}+4\hat{k})=13$

(13) The equation of the straight line passing through $(4,-4,7)$ and parallel to z – axis is

(1) $\frac{x-4}{1}=\frac{y+4}{1}=\frac{z-7}{0}$ (2) $\frac{x-4}{0}=\frac{y+4}{1}=\frac{z-7}{1}$
(3) $\frac{x-4}{1}=\frac{y+4}{0}=\frac{z-7}{0}$ (4) $\frac{x-4}{0}=\frac{y+4}{0}=\frac{z-7}{1}$

(14) The angle between the planes $\vec{r}\cdot(2\hat{i}-\hat{j}+\hat{k})=16$ and $\vec{r}\cdot(\hat{i}+\hat{j}+2\hat{k})=19$ is

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

(15) The direction cosines of the line $x=y=z$ are

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

(16)The point of intersection of the line $\frac{x-1}{1}=\frac{y+3}{3}=\frac{z-2}{2}$ with the plane $3x-2y+z=11$ is

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

(17) The coordinates of $\triangle ABC$, where A,B,C are the points of intersection of the plane $6x+3y+2z=36$ with the coordinate axes, is

(1) $(2,4,6)$ (2) $(4,6,2)$ (3) $(6,4,2)$ (4) $(6,2,4)$

(18) Distance of the point $(2,3,4)$ from the plane $3x-6y+2z+11=0$ is

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

(19) If the line $\vec{r}=(a_1\hat{i}+a_2\hat{j}+a_3\hat{k})+t(l\hat{i}+m\hat{j}+n\hat{k})$ is parallel to the plane $\vec{r}\cdot(a\vec{i}+b\vec{j}+c\vec{k})=d$, then

(1) $\frac{a}{l}+\frac{b}{m}+\frac{c}{n}=0$ (2) $\frac{a}{l}=\frac{b}{m}=\frac{c}{n}$

(3) $al+bm+cn=0$ (4) $ax_1+by_1+cz_1=d$

(20) The angle between the straight lines $\vec{r}=(\hat{i}+2\hat{j}+3\hat{k})+s(2\hat{i}+5\hat{j}+4\hat{k})$ and $\vec{r}=(\hat{i}-2\hat{j}+3\hat{k})+t(\hat{i}+2\hat{j}-3\hat{k})$ is

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

(21) The equation of the straight line passing through $(4,5,6)$ and perpendicular to the plane $\vec{r}\cdot(\hat{i}+3\hat{j}-5\hat{k})=10$ is

(1) $\vec{r}=(4\hat{i}+5\hat{j}+6\hat{k})+t(\hat{i}+3\hat{j}-5\hat{k})$ (2) $\vec{r}=(\hat{i}+3\hat{j}-5\hat{k})+t(4\hat{i}+5\hat{j}+6\hat{k})$

(3) $\vec{r}=(4\hat{i}+5\hat{j}+6\hat{k})+t(\hat{i}-3\hat{j}+5\hat{k})$ (4) $\vec{r}=(\hat{i}-3\hat{j}+5\hat{k})+t(4\hat{i}+5\hat{j}+6\hat{k})$

12 STD **Chapter 7** **MATHS**

1. A stone is thrown vertically upwards from the top of a tower 64 ft high according to the law s = 48t – 16t^2. The greatest height attained by the stone above the ground is
   a. 100 ft b. 64 ft c. 36ft d. 32ft
2. The volume of a sphere is increasing at the rate of 1200 cm/sec. The rate of increase in its surface area when the radius is 10cm is
   a. 120 sq.cm / sec b. 240 sq.com / sec c. 300 sq.cm / sec d. 400 sq.cm / sec
3. A man of 2m height walks at a uniform speed of 6km/hr away from a lamp post of 6m height. The rate at which the length of his shadow increases is
   a. 3 km / hr b. 2km / hr c. 3 / 2 km / hr d. 1 km / hr
4. The point on the curve $y^2 = x$ where the tangent makes an angle $\frac{\pi}{4}$ with x- axis
   a. (1,1) b. $\left(\frac{1}{4},\frac{1}{2}\right)$ c. $\left(\frac{1}{2},\frac{1}{4}\right)$ d. (4,2)
5. The curve $x^2 - xy + y^2 = 27$ has tangents parallel to x – axis at
   a. (-3,-6) and (3,-6) b. (3,6) and (-3,-6) c.(-3,6) and (-3,-6) d. (3,-6) and (-3,6)
6. The normal to a curve $y = f(x)$ is parallel to the x – axis if
   a. $\frac{dx}{dy} = 0$ b. $\frac{dy}{dx} = 0$ c. $\frac{dx}{dy} = 1$ d. $\frac{dy}{dx} = 1$
7. Let $f(x) = \sqrt{x+4}$ the values of c that satisfies the mean value theorem for the function on the interval [0,5]
   a. 2 b. 2.25 c. 2.5 d. 2.75
8. The series $\sum_{n=0}^{\infty}(-1)^n \frac{x^{2n}}{(2n)!} 4^n$ is a Maclaurin series expansion for the function
   a. Cos x b. Cos 2x c. sin x d. sin2 x
9. In which of the following intervals the function $y(x) = x^3 - 3x^2 - 9x + 5$ is always decreasing?
   a. (-1,3) b. (-3,3) c. (-4,4) d. (-2,2)
10. The function $f(x) = \frac{x}{3} + \frac{3}{x}$ decreases in the interval
    a. (-3,3) b. $(-\infty,3)$ c. $(3,\infty)$ d. (-9,9)
11. The maximum value of $\frac{\log x}{x}$ is
    a. 1 b. $\frac{2}{3}$ c. e d. $\frac{1}{e}$
12. The maximum area of a rectangle that can be inscribed in a circle of radius 2 units is
    a. 8π sq. units b. 4π sq. units c. 8 sq. units d. 4 sq. units
13. The maximum value of xy subject to $x+y=16$ is
    a. 8 b. 16 c. 32 d. 64
14. $\lim_{x \to -2} \frac{\sin \pi x}{x^2 - 4} =$
    a. $-\frac{\pi}{4}$ b. $+\frac{\pi}{4}$ c. $-\frac{\pi}{2}$ d. $+\frac{\pi}{2}$
15. For the function $y = e^x - x$ at $x = 0$ is
    a. Concave up b. concave down
    c. an inflection point d. The function is not differentiable

1. If $y=(x^2-5)^3$, $x = 1$ $dx = 0.02$ then dy =
   a) 21,6 b) 2,16 c) 7,6 d) 0,72
2. If $y = x+\cos x$ and $x = \frac{5}{6}$ $dx = 0.02$ then dy is
   a) 0.1 b) 0.01 c) 0.001 d) 0.025
3. If $f(x,y) = x\cos xy$ find f_x at $\left(2, \frac{5}{4}\right)$
   a) $\frac{\pi}{2}$ b) $\frac{-\pi}{2}$ c) $\frac{\pi}{4}$ d) $\frac{-\pi}{4}$
4. If $u = \tan^{-1}\left(\frac{x^3+y^3}{x-y}\right)$ and $f = \tan u$ then the degree of the homogenous function f is
   a) 3 b)1 c) 2 d) 0
5. If $u = \log\left(\frac{x^2+y^2}{xy}\right)$ and $e^u = f$ then the degree of f is
   a) 0 b)1 c) 2 d) 4
6. If $u = y^x$ then $\frac{\partial u}{\partial y}$ is equal to
   a) $u\log y$ b) u logx c) xy^{x-1} d) yx^{y-1}
7. If $f(x,y) = x^2y + y^2x + xy + 5$ for all $\forall x, y \in \mathbb{R}^2$ then $\frac{\partial f}{\partial x}(-1,2)$ is
   a) 2 b) 0 c) 4 d) -4
8. An harmonic function u is a defined as $u(x,y) = e^{-2x}\sin 2y$ then $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}$ is
   a) u b) –u c) 0 4) e^u
9. If $w(x,y) = y^3 - 3x^2y + x^3, x, y \in R$ then the linear approximation of w at (1,-1) is
   a) 4-3x b) 4x – 3 c) 0 4) -3
10. If $x = r\cos\theta, y = r\sin\theta$ then $\frac{\partial r}{\partial y}$ is equal to
    a) $\cos\theta$ b) $\sin\theta$ c) $\tan\theta$ d) $\operatorname{cosec}\theta$
11. If $u = \frac{1}{\sqrt{x^2+y^2}}$ then $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$ is equal to
    a) $\frac{1}{2}u$ b) u c) $\frac{3}{2}u$ d) u^{-1}
12. If $u = \log\left(\frac{x^2+y^2}{xy}\right)$ then $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$ is equal to
    a) 0 b) u c) 2u d) u^{-1}
13. Given $u = e^{x^3} + y^3$ then $\frac{\partial u}{\partial y}$ is equal to a)3u b) u c) $3x^2u$ d) $3y^2u$
14. If $u = ax^2 + by^2 + cz^2 + 2fyz + 2gzx + 2hxy$ and $\sum \frac{\partial^2 u}{\partial x^2} = 0$ then
    a) $a = 0$ b) $a+b+c=0$ c) b = 0 4) c = 0
15. Linear approximation of $\tan x$ at $x = 0$ is a) $-x$ b) x c) 0 d) $\frac{\pi}{4}$

Applications of Integration

1. If $\int_0^a 3x^2 dx = 8$, then the value of a is

   a) 1 b) 3 c) 4 d) 2

2. The value of $\int_0^1 x^2 e^{x^3}$ dx is

   a) $\frac{1}{3}(1-3)$ b) $\frac{1}{2}(1-e)$ c) $\frac{1}{3}(e-1)$ d) $\frac{1}{2}(e-1)$

3. If $\int_0^a \sqrt{x}\, dx = 4a \int_0^{\frac{\pi}{4}} \sin 2x\, dx$ then a is a) 3 b) 4 c) 9 d) 12

4. The value of $\int_0^{\frac{\pi}{2}} \frac{\text{Sin}8x \log(\cot x)}{Cos 2x}$ dx is a) $\frac{\pi}{2}$ b) 0 c) $\frac{\pi}{8}$ d) π

5. The value of $\int_0^1 \tan^{-1}\left(\frac{2x-1}{1+x-x^2}\right)dx$ is a) 0 b) $\frac{\pi}{4}$ c) π d) $\frac{\pi}{2}$

6. The area of the region bounded by the curve $y = x^2$ and the line $y = 4$ is

   a) $\frac{10}{3}$ b) $\frac{32}{3}$ c) $\frac{20}{3}$ d) $\frac{25}{3}$

7. The value of $\int_0^{\frac{\pi}{2}} \frac{\sin x}{1+\cos^2 x} dx$ is a) $\frac{\pi}{4}$ b) $\frac{\pi}{2}$ c) π d) 2π

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

   a) $f(2a-x) = f(x)$ b) $f(2a-x) = -f(x)$ c) $f(a-x) = f(x)$ d) $f(a-x) = -f(x)$

9. The area of the region bounded by the line $x - y = 1$ and $x - axis$ $x = -2$ and $x = 0$ is

   a) 4 b) 3 c) 5 d) 7

10. The value of $\int_0^{\frac{\pi}{4}} \cos^8 2x$ a) $\frac{35\pi}{512}$ b) $\frac{15\pi}{512}$ c) $\frac{5\pi}{512}$ d) $\frac{45\pi}{512}$

11. The value of $\int_0^\infty x^8 e^{\frac{-x}{3}} dx$ is a) $3^9 \angle 9$ b) $3^9 \angle 8$ c) $3^8 \angle 9$ d) $3^8 \angle 8$

12. The volume of the solid generated by revolving the region bounded by the curve $y = x^3$, about y – axis and between the lines $x = 0$ and $y = 1$ is

    a) $\frac{3\pi}{5}$ b) $\frac{2\pi}{5}$ c) $\frac{\pi}{5}$ d) $\frac{4\pi}{5}$

13. The volume of the solid generated when the region enclosed by $y = \sqrt{x}$, y = 2 and $x = 0$ is revolved about the y – axis is

    a) $\frac{32\pi}{5}$ b) $\frac{22\pi}{5}$ c) $12\frac{\pi}{5}$ d) $\frac{42\pi}{5}$

14. The value of $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} x\sin x\, dx$ is a) 0 b) 2 c) 4 d) 5

15. The value of $\int_0^1 x^2 e^x dx$ is a) e -1 b) e-3 c) e-2 d) e-4

1. The degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^{\frac{3}{2}} - y^{\frac{1}{2}} - 8 = 0$ is (a) 6 (b) 4 (c) 3 (d) 2

2. The solution of the differential equation $\frac{dy}{dx} + \sin^2 y = 0$ is (a) $y = \cot x + c$ (b) $x = \cot y + c$ (c) $y + \cos y = c$ (d) $x + \cos x = c$

3. $y = Ae^{mx} + Be^{-mx}$ is a solution of the differential equation (a) $\frac{dy}{dx} + my = 0$ (b) $\frac{dy}{dx} - my = 0$ (c) $\frac{d^2y}{dx^2} + m^2y = 0$ (d) $\frac{d^2y}{dx^2} - m^2y = 0$

4. The integrating factor of the differential equation $\frac{dy}{dx} + y\cot x = 4x + x^2\cot x$ is (a) $\log\cos x$ (b) $\log\sin x$ (c) $\cos x$ (d) $\sin x$

5. The differential equation $y\frac{dy}{dx} + x = c$ represents the family of (a) parabolas (b) circles (c) ellipses (d) hyperbolas

6. The solution of $\frac{dy}{dx} = \left(\frac{y}{x}\right)^{\frac{1}{3}}$ is (a) $y^{\frac{2}{3}} - x^{\frac{2}{3}} = c$ (b) $y^{\frac{1}{3}} - x^{\frac{1}{3}} = c$ (c) $x^{\frac{1}{3}} + y^{\frac{1}{3}} = c$ (d) $x^{\frac{2}{3}} + y^{\frac{2}{3}} = c$

7. The integrating factor of the differential equation $(x + y + 1)\frac{dy}{dx} = 1$ is (a) e^x (b) e^{-x} (c) e^y (d) e^{-y}

8. Consider the following statements : I. The general solution of $\frac{dy}{dx} = \varphi(x) + x$ is of the form $y = y(x) + c$, where c is an arbitrary constant. II. The degree of $\frac{dy}{dx} = \varphi(x) + x$ is 1.

Which of the above is/are true? (a) only I (b) only II (c) both I and II (d) neither I nor II

9. The degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^3 + e^{\frac{dy}{dx}} = 0$ is (a) 2 (b) 1 (c) 3 (d) not defined

10. The differential equation of the family of curves $y = A(x+B)^2$, where A and B are arbitrary constants is (a) $yy'' = (y')^2$ (b) $2yy'' = (y')^2$ (c) $2yy'' = y' + y$ (d) $2yy'' = y' - y$

11. The differential equation of the family of curves $y = A\cos ax + B\sin ax$, where A and B are arbitrary constants is (a) $y'' + a^2y = 0$ (b) $y'' - a^2y = 0$ (c) $y'' + ay = 0$ (d) $y'' - ay = 0$

12. The order and degree of the differential equation $y = x\left(\frac{dy}{dx}\right)^2 + \left(\frac{dx}{dy}\right)^2$ are respectively (a) 1, 4 (b) 4, 1 (c) 1, 1 (d) 2, 1

13. The slope of a curve at any point is the reciprocal of twice the ordinate at the point and it passes through the point (4,3). The equation of the curve is (a) $x^2 = y - 5$ (b) $x^2 = y + 5$ (c) $y^2 = x + 5$ (d) $y^2 = x - 5$

14. The solution of the differential equation $\frac{dy}{dx} = x + y, y(0) = 0$ is (a) $y = e^x + x - 1$ (b) $y = e^x - x - 1$ (c) $y = e^{-x} + x + 1$ (d) $y = e^{-x} - x - 1$

15. The equation of the curve passing through (1, 1) and satisfying the differential equation $\frac{dy}{dx} = \frac{2y}{x}, x > 0, y > 0$ is

(a) $y = 2x$ (b) $x = 2y$ (c) $y = x^2$ (d) $y^2 = x$

1) A random variable X has the following probability distribution

X	-2	-1	0	1
$P(X=x_i)$	$\frac{1-a}{4}$	$\frac{1+2a}{4}$	$\frac{1-2a}{4}$	$\frac{1+a}{4}$

(1)'a' can have any real value (2) $\frac{1}{4}\le a\le\frac{1}{3}$ (3) $-\frac{1}{2}\le a\le\frac{1}{2}$ (4) $-1\le a\le 1$

2) A random variable X has the following probability distribution

X	2	5	6	7
$P(X)$	$\frac{1}{10}$	x	$\frac{3}{10}$	$\frac{4}{10}$

Find the mean and variance of X. (1) 5.4, 2 (2) 5.8, 2.16 (3) 5.8, 2 (4) none

3) A box contains 10 tickets. 2 of the tickets carry a price of `.8 each, 5 of the tickets carry a price of `. 4 each, and 3 of the tickets carry a price of `.2 each. If one ticket is drawn, what is the expected value of the price? (1) 3.4 (2) 2.8 (3) 3.1 (4) 4.2

4) When a coin is tossed thrice, the probability distribution of X when X assumes values of getting no head, one head, two heads , three heads is formed. Variance on X is (1) $\frac{3}{4}$ (2) $\frac{3}{2}$ (3) 1 (4) 2

5) A random variable has its range $=\{0,1,2\}$ and the probabilities are given by $P(X=0)=3k^2$, $P(X=1)=4k-10k^2$, $P(X=2)=5k-1$, where k is a constant. Find k. (1) 1 (2) 2 (3) 3 (4) $\frac{2}{7}$

6) A random variable has its range $=\{0,1,2\}$ and the probabilities are given by $P(X=0)=3k^2$, $P(X=1)=4k-10k^2$, $P(X=2)=5k-1$, where k is a constant. Find $P(0<x<3)$.

(1) $\frac{1}{9}$ (2) $\frac{1}{2}$ (3) $\frac{8}{9}$ (4) 1

7) A random variable X takes the values of $0, 1, 2$. It's mean is 1.2. If $P(X=0)=0.3$, then $P(X=1)$ is (1)0.3 (2)0.5 (3)0.2 (4)1

8) If the sum of the mean and the variance of the binomial distribution for 5 trials is 1.8, find the binomial distribution.

(1) $5C_r\left(\frac{2}{5}\right)^r\left(\frac{3}{5}\right)^{5-r}$ (2) $5C_r\left(\frac{4}{5}\right)^r\left(\frac{1}{5}\right)^{5-r}$ (3) $5C_r\left(\frac{2}{3}\right)^r\left(\frac{1}{3}\right)^{5-r}$ (4) $5C_r\left(\frac{1}{3}\right)^r\left(\frac{2}{3}\right)^{5-r}$

9) If the mean and variance of a binomial distribution are $\frac{15}{4}$ and $\frac{15}{16}$. The number of trials is

(1)5 (2)4 (3)16 (4)20

10) The probability of a success in a Bernoulli experiment is 0.40. The experiment is repeated 50 times. The mean of the binomial distribution of the number of successes is (1)12 (2)20 (3)30 (4)35

11) If X is a random variable in which distribution given below

X	-2	-1	0	1	2	3
$P(X)$	0.1	c	0.2	$2c$	0.3	c

The value of c and variance are (1) 0.1, 2.16 (2) 0.01, 2.16 (3) 1, 2.16 (4) None of the these

12) If the mean and variance of a binomial variable X are respectively $\frac{35}{6}$ and $\frac{35}{36}$, then the probability of $X>6$ is (1) $\frac{1}{2}$ (2) $\frac{5^7}{6^7}$ (3) $\frac{1}{7^6}$ (4) 0

13) In a binomial distribution the probability of getting success is $\frac{1}{4}$ and the standard deviation is 3. Then its mean is (1) 6 (2) 8 (3) 10 (4) 12

14) Suppose X follows a binomial distribution with parameters n and p, where $0 < p < 1$. If $\frac{P(X=r)}{P(X=n-r)}$ is independent of n for every r, then p is

(1) $\frac{1}{2}$ (2) $\frac{1}{3}$ (3) $\frac{1}{4}$ (4) $\frac{1}{8}$

1. Identify the open statement

   (1) x is a real number (2) Wish you a happy Pongal

   (3) Good night to all (4) Can you bring a book?

2. Which one of the following is not a statement in logic?

   (1) 7 is a prime (2) π is irrational

   (3) 9 is an odd number (4) Social Science is interesting

3. Let $p = A$ has passed the examination $q = A$ is sad. Then the statement : "It is not true that A passes therefore A is sad" in a symbolic form is

   (1) $\neg p \rightarrow q$ (2) $\neg p \rightarrow \neg q$ (3 $\neg(p \rightarrow \neg q)$ (4) $\neg(p \rightarrow q)$

4. The converse of the statement: "If it is raining then it is cool" is

   (1) If it is cool then it is raining (2) If it is not cool then it is raining

   (3) If it is not cool then it is not raining (4) If it is not raining then it is not cool

5. Which one of the following is logically equivalent to $\neg p \vee \neg q$?

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

6. The proposition $p \rightarrow \neg(p \wedge q)$ is a

   (1) tautology (2) contradiction (3) contingency (4) either (1) or (2)

7. Let $A = \{20, 30, 40, 50, 60\}$. Which one of the following is not true?

   (1) $x \in A$ such that $x + 30 = 80$ (2) $x \in A$ such that $x + 20 < 50$

   (3) $x \in A$ such that $x + 20 < 90$ (4) $\forall x \in A$ such that $x + 60 \geq 90$

8. Let R be the relation over the set ¥ ×¥ and be defined by $(a,b)R(c,d) \leftrightarrow a + d = b + c$. Then the relation R is

   (1) Reflective only (2) Symmetry only

   (3) Transitive only (4) an equivalence relation

9. Which one of the following define on R^2 is not an equivalence relation?

   (1) $(x, y) \in R \times R \leftrightarrow x \geq y$ (2) $(x, y) \in R \times R \leftrightarrow x = y$

   (3) $(x, y) \in R \times R \leftrightarrow x - y$ is a multiple of 3 (4) $(x, y) \in R \times R \leftrightarrow |x - y|$ is even

10. If $A = \{1, 2, 3\}$ then the number of equivalence relations containing (1,2) is

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

2019 PTA CREATED 1 MARKS

1. If A and B are orthogonal Then $(AB)^T(AB)$ is

Soln: $AA^T = A^TA = I$, $BB^T = B^TB = I$

$(AB)^T AB = (B^TA^T)(AB)$

$= B^T(A^TA)B$

$= B^T(I)B = B^TB$

$\boxed{(AB)^T(AB) = I}$

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

Soln: $(y-0)^2 = 4(\frac{1}{4})(x+4) \Rightarrow a = \frac{1}{4}$

Directrix $x = -a$

$x+4 = -\frac{1}{4} \Rightarrow x = \frac{-1}{4} - 4$

$\boxed{x = \frac{-17}{4}}$

3. If the line $\frac{x-1}{3} = \frac{y-2}{4} = \frac{z-3}{\lambda}$ is perpendicular to the plane $\vec{r}.(2\hat{i}+3\hat{j}+4\hat{k}) = 0$ Then the value of λ is

Soln: $\frac{x-1}{3} = \frac{y-2}{4} = \frac{z-3}{\lambda}$, $\vec{r}.(2\hat{i}+3\hat{j}+4\hat{k}) = 0$

$(3\hat{i}+4\hat{j}+\lambda\hat{k}).(2\hat{i}+3\hat{j}+4\hat{k}) = 0 \Rightarrow 6+12+4\lambda = 0$

$4\lambda = -18 \Rightarrow \boxed{\lambda = -9/2}$

4. The value of $\int_0^{\pi}(\sin x + \cos x)dx = [-\cos x + \sin x]_0^{\pi/4}$

$= (-\cos\pi + \sin\pi) - (-\cos 0 + \sin 0)$

$= (-(-1)+0) - (-1+0)$

$= 1+1$

$\int_0^{\pi}(\sin x + \cos x)dx = 2$

5. All complex numbers z which satisfy the equation $\left|\frac{z-6i}{z+6i}\right| = 1$ lie on the

Soln: $\left|\frac{z-6i}{z+6i}\right| = 1 \Rightarrow |x+iy-6i| = |x+iy+6i|$

$\sqrt{x^2+(y-6)^2} = \sqrt{x^2+(y+6)^2} \Rightarrow x^2+y^2+36-12y = x^2+y^2+36+12y$

$24y = 0$

$\boxed{y=0}$. real axis.

6. If the rate of increase of the radius of a circle is 5 cm/sec, Then the rate of increase of its area when the radius is 20 cm, will be

Soln: $A = \pi r^2$, $\frac{dr}{dt} = 5$ cm/sec

$\frac{dA}{dt} = \pi(2r)\frac{dr}{dt}$

$= \pi(2\times 20)5$

$\boxed{\frac{dA}{dt} = 200\pi}$

The area bounded by the curve $y^2 = 4x$ and the lines $x=1, x=4$ and x axis in the first quadrant is

soln $y^2 = 4x$, $x=1, x=4$

$$\text{Area} = \int_a^b y\,dx = \int_1^4 \sqrt{4x}\,dx = 2\left(\frac{x^{3/2}}{3/2}\right)_1^4 = \frac{4}{3}\left[4^{3/2} - 1^{3/2}\right] = \frac{4}{3}(8-1)$$

$\boxed{\text{Area} = \frac{28}{3}}$

The vertex of the parabola $x^2 = 8y - 1$ is

soln $x^2 = 8y-1 \Rightarrow x^2 = 8(y - \frac{1}{8})$

$(x-0)^2 = 4(2)(y-\frac{1}{8}) \Rightarrow (x-h)^2 = 4a(y-k)$

vertex $= (h, k)$

$\boxed{\text{vertex} = (0, \frac{1}{8})}$

If $x+y=k$ is a normal to the parabola $y^2=16x$ Then the value of k is

soln : $x+y=k$, $y^2=16x \rightarrow ①$

$y=-x+k$, slope of normal $=-1$, slope of tangent $=1$

$y^2=16x \Rightarrow 2y\frac{dy}{dx} = 16 \Rightarrow \frac{dy}{dx} = \frac{8}{y}$

$1 = \frac{8}{y} \Rightarrow \boxed{y=8}$

$① \Rightarrow 8^2 = 16x \Rightarrow x = \frac{64}{16}$ $\boxed{x=4}$

$k = x+y = 4+8 = 12$

$\boxed{k=12}$

10. If $f(x) = \frac{x-1}{x+1}$, Then its differential is given by

soln $f(x) = \frac{x-1}{x+1} \Rightarrow y = \frac{x-1}{x+1}$ $\frac{dy}{dx} = \frac{(x+1)(1)-(x-1)(1)}{(x+1)^2}$

$\frac{dy}{dx} = \frac{x+1-x+1}{(x+1)^2} \Rightarrow \boxed{dy = \frac{2}{(x+1)^2}dx}$

The value of $\int_0^1 \log\left(\frac{x}{1-x}\right)dx$

soln $I = \int_0^1 \log\left(\frac{x}{1-x}\right)dx \rightarrow ①$ $I = \int_0^1 \log\left(\frac{1-x}{1-(1-x)}\right)dx$ $\int_0^1 \log\left(\frac{1-x}{x}\right)dx \rightarrow ②$

$① + ② \Rightarrow \int_0^1 \log\left(\frac{x}{1-x}\right) + \log\left(\frac{1-x}{x}\right)dx$

$= \int_0^1 \log\left(\frac{x}{1-x} \times \frac{1-x}{x}\right)dx = \int_0^1 \log(1)dx$

$2I = 0$ [$\log 1 = 0$]

$\boxed{I=0}$

12. If the mean of a binomial distribution is 5 and its variance is 4 Then the value of n and p are

soln :

$np = 5$, $npq = 4$

$\Rightarrow q = 4/5 \Rightarrow p = 1/5$

$\Rightarrow n(1/5) = 5$ $\boxed{n=25}$

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

13. The adjoint of 3×3 matrix P is $\begin{bmatrix} -1 & 2 & 2 \\ 1 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ Then the possible value(s) of the determinant P is

Soln :

$|adj\,P| = |P|^{n-1} \quad n = 3.$

$|adj\,P| = |P|^2 \Rightarrow |P| = \pm\sqrt{|adj\,P|}$

$|adj\,P| = \begin{vmatrix} -1 & 2 & 2 \\ 1 & 1 & 2 \\ 2 & 2 & 1 \end{vmatrix} = -1(1-4) - 2(1-4) + 2(2-2)$

$= 3 + 6$

$= 9$

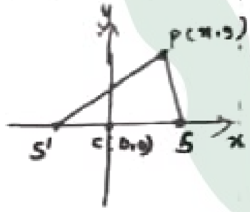
$\sqrt{|adj\,P|} = \sqrt{9} = \pm 3$

14. If $x = \frac{-1+i\sqrt{3}}{2}$ Then the value of x^2+x+1.

Soln :

$x = \frac{-1+i\sqrt{3}}{2}, \quad x^2 = \frac{-1-i\sqrt{3}}{2} \quad \therefore x^2+x+1 = 0 \quad (\because 1+\omega+\omega^2=0)$

15. If $P(x,y)$ be any point on $4x^2+9y^2=36$, Then the sum of the distances of P from the points $(\sqrt{5},0)$ and $(-\sqrt{5},0)$ is



Soln :

$4x^2+9y^2 = 36$

$\frac{x^2}{9} + \frac{y^2}{4} = 1 \Rightarrow a^2 = 9 \quad b^2 = 4.$

$a = 3$

$SP + S'P = 2a$

$= 2(3)$

$\boxed{SP + S'P = 6}$

16. If the plane $x+\alpha y+z-8=0$ has equal intercepts on the coordinate axes The value of α is

Soln :

$x+\alpha y+z = 8 \quad \div 8 \Rightarrow \frac{x}{8} + \frac{y}{8/\alpha} + \frac{z}{8} = 1$

Here $a = 8,\ b = 8/\alpha \quad c = 8$

Given. Intercepts are equal

$a = b \Rightarrow 8 = 8/\alpha$

$\boxed{\alpha = 1}$

17. The solution of the differential equation $\frac{dy}{dx} = e^x + 2$ is

Soln :

$dy = (e^x+2)\,dx$

$\int dy = \int (e^x+2)\,dx$

$\boxed{y = e^x + 2x + C}$

18. If A is a 3×3 matrix Such that $|3\,adj\,A| = 3$ Then $|A|$ is equal to

Soln

$|3\,adj\,A| = 3 \quad (\because |kA| = k^3|A|).$

$3^3|adj\,A| = 3 \quad (\because |adj\,A| = |A|^{n-1})$

$27|A|^{3-1} = 3$

$|A|^2 = \frac{1}{9}$

$\boxed{|A| = \pm\frac{1}{3}}$

19. The value of $i^{201}+i^{202}+i^{203}$ is

soln $i^{200}(i+i^2+i^3) = (i^4)^{50}(i-1-i) = -1$

20. The axis of the parabola $y^2-2y+8x-23=0$

soln $y^2-2y+8x-23=0 \Rightarrow (y-1)^2 = -8(x-3)$

since the axis of the parabola is x axis is

$y-1=0$

$\boxed{y=1}$

21. The slope of the curve $y^3-xy^2=4$ at the point where $y=2$ is

soln $y^3-xy^2=4 \rightarrow ①$

when $y=2$ ① ⇒ $x=1$

Diff ① w.r.t 'x', $3y^2\frac{dy}{dx}-2xy\frac{dy}{dx}-y^2=0$

$\frac{dy}{dx}(3y^2-2xy)=y^2 \Rightarrow \frac{dy}{dx}=\frac{y^2}{3y^2-2xy}$

Slope ⇒ $\left(\frac{dy}{dx}\right)_{(1,2)} = \frac{4}{12-4} = \frac{4}{8} = \frac{1}{2}$

22. The point of inflection of curve $y=(x-1)^3$ is

soln $y' = 3(x-1)^2$, $y''=6(x-1)$, $y''=0 \Rightarrow x-1=0 \Rightarrow \boxed{x=1}$

when $x=1 \Rightarrow y=0$ ∴ The point of inflection is $(1,0)$

23. The continued product of the four values of $\left(\cos\frac{\pi}{3}+i\sin\frac{\pi}{3}\right)^{3/4}$ is

soln $\left(cis\frac{\pi}{3}\right)^{3/4} = (cis\,\pi)^{1/4} = cis(2k+1)\frac{\pi}{4}$ $k=0,1,2,3$

Product of the roots $= \left(cis\frac{\pi}{4}\right)\left(cis\frac{3\pi}{4}\right)\left(cis\frac{5\pi}{4}\right)\left(cis\frac{7\pi}{4}\right)$

" $= cis\left(\frac{\pi}{4}+\frac{3\pi}{4}+\frac{5\pi}{4}+\frac{7\pi}{4}\right) = cis\left(\frac{16\pi}{4}\right) = cis(4\pi)$

product of the roots $= \cos 4\pi + i\sin 4\pi) = 1+i(0) = 1$

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

soln let $f(x)=\frac{\sin x}{2+\cos x}$ $f(-x)=\frac{\sin(-x)}{2+\cos(-x)} = \frac{-\sin x}{2+\cos x} = -f(x)$

∴ $f(x)$ is odd function $\boxed{\int_{-\pi/2}^{\pi/2}\frac{\sin x}{2+\cos x}dx = 0}$.

25. The equation of the plane passing through $(3,4,5)$ and parallel to the plane $x+2y-2z-9=0$ is

soln The required eqn is of the form $x+2y-2z+k=0$. But it passes through $(3,4,5)$

∴ $\boxed{k=1}$ ∴ $\boxed{x+2y-2z-1=0}$ (or) $\boxed{x+2y-2z=1}$

26. Let A be a non-singular matrix Then which one of the following is false

soln: (a) $(adj A)^{-1} = \frac{A}{|A|}$ (b) I is an orthogonal matrix

(c) $adj(adj A) = |A|^n A$ (d) If A is symmetric Then adj A is symmetric.

ANSWER : $adj(adj A) = |A|^n A$