CHAPTER 1 – THREE MARKS QUESTIONS.

1. Find the inverse of the matrix : $\begin{pmatrix} -1 & 2 \\ 1 & -4 \end{pmatrix}$

2. For any non-singular matrix A, show that $\left(A^T\right)^{-1} = \left(A^{-1}\right)^T$

CHAPTER 1 – SIX MARKS QUESTIONS.

1. Find the rank of the matrix. $\begin{bmatrix} 3 & 1 & -5 & -1 \\ 1 & -2 & 1 & -5 \\ 1 & 5 & -7 & 2 \end{bmatrix}$

2. Find the rank of the matrix. $\begin{bmatrix} 1 & -2 & 3 & 4 \\ -2 & 4 & -1 & -3 \\ -1 & 2 & 7 & 6 \end{bmatrix}$

3. Find the rank of the matrix $\begin{bmatrix} 0 & 1 & 2 & 1 \\ 2 & -3 & 0 & -1 \\ 1 & 1 & -1 & 0 \end{bmatrix}$

4. Find adjoint of A if A = $\begin{bmatrix} 1 & 2 \\ 3 & -5 \end{bmatrix}$ **and verify** $A(adjA)=(adj\,A)A=|A|.I$

5. Verify that $(A^{-1})^T=(A^T)^{-1}$ **if** $A=\begin{bmatrix} -2 & -3 \\ 5 & -6 \end{bmatrix}$

6. If $A=\begin{bmatrix} 1 & 2 \\ 1 & 1 \end{bmatrix}$ **and** $B=\begin{bmatrix} 0 & -1 \\ 1 & 2 \end{bmatrix}$**, verify that** $(AB)^{-1}=B^{-1}A^{-1}$**.**

7. S.T the adjoint of $A=\begin{vmatrix} -4 & -3 & -3 \\ 1 & 0 & 1 \\ 4 & 4 & 3 \end{vmatrix}$ **is A itself.**

8. For $A=\begin{bmatrix} -1 & 2 & -2 \\ 4 & -3 & 4 \\ 4 & -4 & 5 \end{bmatrix}$ **show that** $A=A^{-1}$

9. Solve by matrix inversion method. x+y=3, 2x+3y=8

10. Solve the following non-homogeneous equations of 3 unknowns using determinants : $2x+2y+z=5,\ x-y+z=1,\ 3x+y+2z=4$

11. Examine the consistency of the system of equations using rank method

$x+y+z=7,\ x+2y+3z=18,\ y+2z=6$

CHAPTER 1 – TEN MARKS QUESTIONS.

1. **A bag contains 3 types of coins namely Re.1, Rs.2 & Rs.5. There are 30 coins amounting to Rs.100 in total. Find the number of coins in each category.**

2. **A small seminar hall can hold 100 chairs. 3 different colours (red, blue, green) of chairs are available. The cost of a red chair is Rs.240. Cost of Blue chair is Rs.260 and the cost of a green chair is Rs.300. The total cost is Rs.25,000. Find atleast 3 different solution of the number of chairs in each colour to be purchased.**

3. **Show that the equations x+y+z=6, x+2y+3z=14, x+4y+7z=30 are consistent and solve them.**

4. **Verify whether the given system of equations is consistent. If it is consistent, solve 2x+5y+7z=52, x+y+z=9, 2x+y–z=0.(Rank Method)**

5. **Examine the consistency of the equations by rank method. If it is consistent, then solve x + y – z = 1, 2x + 2y – 3z = 13, 2x – 3y + 3z = –32**

6. **Examine the consistency using rank method. 2x–3y+7z=5, 3x+y–3z=13, 2x+19y–47z=32.**

7. **Solve by matrix determinant method x + 2y + z = 7, 2x – y + 2z = 4, x + y – 2z = –1**

8. **Solve by determinant method.** $\frac{1}{x}+\frac{2}{y}-\frac{1}{z}=1,\ \frac{2}{x}+\frac{4}{y}+\frac{1}{z}=5,\ \frac{3}{x}-\frac{2}{y}-\frac{2}{z}=0$

9. **Solve by matrix inversion method 2x–y + 3z = 9, x + y + z = 6, x – y + z = 2**

10. **For what values of μ of the following equations x+y+3z=0; 4x+3y+μz=0; 2x+y+2z=0 have a (i) trivial solution (ii) Non-trivial solution**

11. For what values of K, the system of equations Kx+y+z=1, x+Ky+z=1, x+y+Kz=1 have (i) unique solution, (ii) more than one solution, (iii) no solution.

12. Investigate for what values of λ, μ the simultaneous equations x+y+z=6, x+2y+3z=10, x+2y+λz=μ have (i) no solution (ii) a unique solution and (iii) an infinite number of solutions.

13. Discuss the solutions of the system of equations for all values of λ, x+y+z=2, 2x+y–2z=2, λx+y+4z=2.

CHAPTER 2 – SIX MARKS QUESTIONS.

1. Diagonals of a rhombus are at right angles. Prove by vector method.

2. Prove that $[\vec{a}\times\vec{b}, \vec{b}\times\vec{c}, \vec{c}\times\vec{a}]=[\vec{a}\ \vec{b}\ \vec{c}]^2$

3. Prove $\frac{a}{Sin\,A}=\frac{b}{Sin\,B}=\frac{c}{Sin\,C}$ **by vector method.**

4. Prove that $[\vec{a}-\vec{b}, \vec{b}-\vec{c}, \vec{c}-\vec{a}]=0$

5. Find the vector and Cartesian equations of the sphere whose centre is (1, 2, 3) and which passes through the point. (5, 5, 3).

6. Find the Vector and Cartesian equation of the sphere on the join of points A,B having position vectors $2\vec{i}+6\vec{j}-7\vec{k}$, $2\vec{i}-4\vec{j}+3\vec{k}$ **respectively as a diameter. Find also the centre and radius of the sphere.**

7. Obtain the vector and Cartesian equation of the sphere whose centre is (1,–1,1) and the radius is the same as that of the sphere $|\vec{r}-(8\vec{i}-6\vec{j}+10\vec{k})|=5$

8. Obtain the vector and Cartesian equation of the sphere whose centre is (1,–1,1) and the radius is the same as that of the sphere $|\vec{r}-(8\vec{i}-6\vec{j}+10\vec{k})|=5$

9 Find the centre and radius of the sphere $\vec{r}^2-\vec{r}.(8\vec{i}-6\vec{j}+10\vec{k})-50=0$

CHAPTER 2 – TEN MARKS QUESTIONS.

1. Prove that Sin (A+B) = SinA CosB + CosA SinB

2. Prove that $\sin(A-B)=\sin A\cos B-\cos A\sin B$

3. Prove that Cos(A–B)=CosA CosB + SinA SinB.

4. Prove that Cos(A+B)=CosA CosB–SinA SinB.

5. Altitudes of a triangle are concurrent-Prove by vector method

6. If $\vec{a}=2\vec{i}+3\vec{j}-\vec{k},\ \vec{b}=-2\vec{i}+5\vec{k},\ \vec{c}=\vec{j}-3\vec{k}$ **then prove that** $\vec{a}\times(\vec{b}\times\vec{c})=(\vec{a}\cdot\vec{c})\vec{b}-(\vec{a}\cdot\vec{b})\vec{c}$

7. Verify $(\vec{a}\times\vec{b})\times(\vec{c}\times\vec{d})=[\vec{a}\ \vec{b}\ \vec{d}]\vec{c}-[\vec{a}\ \vec{b}\ \vec{c}]\vec{d}$, **if** $\vec{a}=\vec{i}+\vec{j}+\vec{k},\ \vec{b}=2\vec{i}+\vec{k},\ \vec{c}=2\vec{i}+\vec{j}+\vec{k},$ $\vec{d}=\vec{i}+\vec{j}+2\vec{k}$

8. Find the vector and Cartesian equation of the plane through the point (2,–1,–3) and parallel to the lines $\frac{x-2}{3}=\frac{y-1}{2}=\frac{z-3}{-4}$, $\frac{x-1}{2}=\frac{y+1}{-3}=\frac{z-2}{2}$

9. Find the vector and Cartesian eqn. of the plane through the point (–1,–2,1) & perpendicular to the planes x+2y+4z+5=0, 2x–y+3z+3=0.

10. Find the vector and Cartesian eqn. of the plane through the points (–1,1,1), (1,–1,1) and perpendicular to the plane x+2y+2z=5

11. Find the vector and Cartesian eqn. of the plane through the points (1,2,3) & (2,3,1) perpendicular to the plane 3x–2y+4z–5=0

12. Derive the equation of plane in the intercept form.

13. Find the vector and Cartesian equation the plane containing the line $\frac{x-2}{2}=\frac{y-2}{3}=\frac{z-1}{-2}$ **and passing through the point (–1,1,–1)**

14. Find the vector and Cartesian eqn. of the plane through the points (2,2,–1), (3,4,2) & (7,0,6)

15 Find the vector and Cartesian eqn. of the plane through the points with position vectors $3\vec{i}+4\vec{j}+2\vec{k},\ 2\vec{i}+2\vec{j}-\vec{k},\ \ 7\vec{i}+\vec{k}$,

16. Find the vector and Cartesian eqn the plane containing the line $\frac{x-2}{2}=\frac{y-2}{3}=\frac{z-1}{3}$ **and parallel to the line** $\frac{x+1}{3}=\frac{y-1}{2}=z+1$

17. S.T the lines $\frac{x-1}{1}=\frac{y+1}{-1}=\frac{z}{3}$ **,** $\frac{x-2}{1}=\frac{y-1}{2}=\frac{-z-1}{1}$ **intersect and find their point of intersection.**

18. ST the lines $\frac{x-1}{3}=\frac{y-1}{-1}=\frac{z+1}{0}$ **,** $\frac{x-4}{2}=\frac{y}{0}=\frac{z+1}{3}$ **intersect & find their point of intersection.**

CHAPTER 3 – SIX MARKS QUESTIONS.

1. Show that the points $(7+9i),(-3+7i),(3+3i)$ **representing the complex numbers form a right angled triangle on the Argand diagram.**

2. Find the square root of $-8-6i$

3. Find the square root of $(-7+24i)$

4. State and prove the triangle inequality of complex numbers.

5. Solve the equation $x^4-8x^3+24x^2-32x+20=0$ **if** $3+i$ **is a root.**

6. Solve the equation $x^4-4x^3+11x^2-14x+10=0$ **if one root is** $1+2i$

7. If n is a positive integer, prove that $(1+i)^n+(1-i)^n=2^{\frac{n+2}{2}}\cos\frac{n\pi}{4} : n\in N$

8. If $x=\cos\alpha+i\sin\alpha,\ y=\cos\beta+i\sin\beta$ **prove that** $x^m y^n+\frac{1}{x^m y^n}=2\cos(m\alpha+n\beta)$

9. If $n\in N$**, Prove that** $(1+i\sqrt{3})^n+(1-i\sqrt{3})^n=2^{n+1}\cos\frac{n\pi}{3}$

CHAPTER 3 – TEN MARKS QUESTIONS.

1. Find all the values of $\left(\frac{1}{2}-i\frac{\sqrt{3}}{2}\right)^{\frac{3}{4}}$ and hence prove that the product of the values is 1.

2. Find all the values of $(\sqrt{3}+i)^{2/3}$

3. If α, β are the roots of the eqn. $x^2-2x+4=0$ then P.T $\alpha^n-\beta^n = i2^{n+1}Sin\frac{n\pi}{3}$ & deduct that $\alpha^9-\beta^9$

4. If α, β are the roots of the eqn. $x^2-2px+(p^2+q^2)=0$, $\tan\theta = \frac{q}{y+p}$ S.T

$$\frac{(y+\alpha)^n-(y+\beta)^n}{\alpha-\beta} = q^{n-1}\frac{Sin n\theta}{Sin^n\theta}$$

5. P represents the variable complex no. of z. Find the locus of P, if

$$I_m\left(\frac{2z+1}{iz+1}\right) = -2$$

6. Solve: $x^9+x^5-x^4-1=0$

7. Solve: $x^4-x^3+x^2-x+1=0$

8. Solve: $x^7+x^4+x^3+1=0$

9. If α & β are the roots of the equation $x^2-2x+2=0$, Cotθ=y+1, Show that

$$\frac{(y+\alpha)^n-(y+\beta)^n}{\alpha-\beta} = \frac{Sin n\theta}{Sin^n\theta}$$

CHAPTER 4 – SIX MARKS QUESTIONS.

1. The headlight of a motor vehicle is a parabolic reflector of diameter 12 cm and depth 4cm. Find the position of bulb on the axis of the reflector for effective functioning of the headlight.

2. Find the equation of the hyperbola if the asymptotes are $2x+3y-8=0$ & $3x-2y+1=0$ and (5, 3) is a point on the hyperbola.

3. Find the equation of two tangents that can be drawn from the point (1,2) to the hyperbola $2x^2-3y^2=6$.

4. Prove that the tangent at any point to the rectangular hyperbola forms with the asymptotes a triangle of constant area

CHAPTER 4 – TEN MARKS QUESTIONS.

1. Find the axis, vertex, focus, directrix, length and equation of latus-rectum and draw their graph for the parabola $y^2+8x-6y+1=0$

2. A cable of suspension bridge is in the form of a parabola whose span is 40 mts. The road way is 5 mts below the lowest point of the cable. If an extra support is provided across the cable 30 mts above the ground level, find the length of the support if the height of the pillars are 55 m.

3. On lighting a rocket cracker it gets projected in a parabolic path and reaches a maximum height of 4 mts when it is 6 mts away from the point of projection. Finally it reaches the ground 12 mts away from the starting point. Find the angle of projection.

4. Assume that water issuing from the end of a horizontal pipe 7.5 m above the ground, describes a parabolic path. The vertex of the parabolic path is at the end of the pipe. At a position 2.5 m below the line of the pipe, the flow of water has curved outward 3 m beyond the vertical line through the end of the pipe. How far beyond this vertical line will the water strike the ground?

5. A grider of a railway bridge is in the form of parabola with span 100ft and the highest point on the arch is 10ft above the bridge. Find the height of the bridge at 10 ft, to the left or right from the mid-point of the bridge.

6. A ladder of length 15m moves with its ends always touching the vertical wall and the horizontal floor. Determine the equation of the locus of a point P on the ladder, which is 6m from the end of the ladder in contact with the floor.

7. A kho-kho player in a practice session while running realises that the sum of the distances from the two kho-kho poles from him is always 8m. Find the equation of the path traced by him if the distance between the poles is 6m.

8. The orbit of the planet Mercury around the Sun is in elliptical shape with sun at a focus. The semi-major axis is of length 36 million miles and the eccentricity of the orbit is 0.206. Find (i) how close the mercury gets to sun? (ii) the greatest possible distance between mercury and sun.

9. The ceiling in a hall way 20ft wide is in the shape of a semi ellipse and 18ft high at the centre. Find the height of the ceiling 4ft from either wall if the height of the side wall is 12 ft.

10. Find the equation of the rectangular hyperbola which has for one of its asymptotes the line x+2y–5=0 passes through the points (6,0), (–3,0).

11. A satellite is travelling around the earth in an elliptical orbit having the earth at a focus and of eccentriccity 1/2 The shortest distance that the satellite gets to the earth is 400 kms. Find the longest distance that the satellite gets from the earth.

12. An arch is in the form of a semi-ellipse whose span is 48 feet wide. The height of the arch is 20 feet. How wide is the arch at a height of 10 feet above the base?

13. The arch of a bridge is in the shape of semi-ellipse having a horizontal span of 40 ft and 16 ft high at the centre. How high is the arch, 9 ft from the right or left of the centre.

14. A comet is moving in a parabolic orbit around the sun which is at the focus of a parabola. When the comet is 80 million kms from the sun, the line segment from the sun to the comet makes an angle of $\pi/3$ radians with the axis of the orbit find (i) the equation of the comet's orbit, (ii) how close does the comet come nearer to the sun? (Take the orbit as open rightward).

15. Find the equation of the hyperbola if its asymptotes are parallel to x + 2y – 12 = 0 and x–2y+8=0, (2,4) is the centre of the hyperbola and it passes through (2,0).

16. Find the axis, vertex, focus, directrix, length and equation of latusrectum and draw their graph for the parabola $x^2-6x-12y-3=0$

CHAPTER 5 – SIX MARKS QUESTIONS.

1. Obtain Maclaurin's series expansion for $\log_e(1+x)$

2. Obtain Maclaurin's series expansion for tanx

3. Verify Rolle's theorem for the function $f(x)=e^x\sin x$, $0\le x\le\pi$

4. Verify Lagrange's law of mean for the function $f(x)=x^3-5x^2-3x$, $[1,\ 3]$

5. Obtain the Maclaurin's series expansion for arc tan x or $\tan^{-1}x$.

6. Evaluate : $\lim\limits_{x \to 0} (\operatorname{cosec} x - \frac{1}{x})$

7. Evaluate : $\lim\limits_{x \to 0} (\operatorname{cosec} x)^{1/x}$

8. Find the intervals on which $f(x)=2x^3+x^2-20x$ is increasing or decreasing.

9. Prove that $\sin x < x < \tan x$, $x \in (0, \frac{\pi}{2})$

10. (b) Find the critical numbers of $x^{3/5}(4-x)^2$

11. Determine the points of inflexion in any, of the function $y = x^3 - 3x + 2$.

CHAPTER 5 – TEN MARKS QUESTIONS.

1. Prove that the sum of the intercepts on the co-ordinate axes of any tangent to the curve $x = a\cos^4\theta,\ y = a\sin^4\theta,\ 0 \le \theta \le \frac{\pi}{2}$ is equal to 'a'

2. Show that the equation of the normal to the curve $x = a\,\mathrm{Cos}^3\theta$, $y = a\,\mathrm{Sin}^3\theta$ at $\theta = 0$ is $x\mathrm{Cos}\theta - y\,\mathrm{Sin}\theta = a\cos 2\theta$.

3. A car is travelling from west to east at 50 km/hr and car B is travelling from south towards north at 60 km/hr. Both are headed for the intersection of the two roads. At what rate are the cars approaching each other when car A is 0.3 km and car B is 0.4 km from the intersection?

4. Gravel is being dumped from a conveyor belt at a rate of 30 ft^3/min and its coarsened such that it forms a pile in the shape of a cone whose base diameter and height are always equal. How fast is the height of the pile increasing when the pile is 10 ft high?

5. Find the equation of tangent and normal to the ellipse $x = a\,\mathrm{Cos}\,\theta$, $y = a\,\mathrm{Sin}\,\theta$ at the point $\theta = \frac{\pi}{4}$

6. Evaluate $\lim_{x \to \pi/2} (\tan x)^{\cos x}$

7. Find the local minimum and maximum values of f(x)= $x^4 - 3x^3 + 3x^2 - x$

8. A farmer has 2400 feet of fencing and want to fence of a rectangular field that borders a straight river. He needs no fence along the river. What are the dimensions of the field that has the largest area?

9. Find the area of the largest rectangle that can be inscribed in a semicircle of radius 'r'

10. The top and bottom margins of a poster are each 6 cms and the side margins are each 4 cms. If the area of the printed material on the poster is fixed at 384 cms^2, find the dimension of the poster with the smallest area.

11. Find the intervals of concavity and the points of inflection of the function $y = 12x^2 - 2x^3 - x^4$

CHAPTER 6 – SIX MARKS QUESTIONS.

1. Find the approximate value of $\sqrt{36.1}$ using differentials.

2. Find $\frac{dw}{dt}$ if $w = e^{xy}$ where $x=t^2$ and $y=t^3$ by using chain rule for partial derivatives.

3. Using chain rule find $\frac{dw}{dt}$ if $w=\log(x^2+y^2)$ where $x=e^t$, $y=e^{-t}$

4. Find $\frac{\partial w}{\partial u}$ and $\frac{\partial w}{\partial v}$ if $w = \sin^{-1} xy$ where x=u+v and y=u–v by using chain rule for partial derivatives.

5. If u is a homogeneous function of x and y of degree n, prove that $x\frac{\partial^2 u}{\partial x^2} + y\frac{\partial^2 u}{\partial x \partial y} = (n-1)\frac{\partial u}{\partial x}$

6. If $u = \log(\tan x + \tan y + \tan z)$ then prove that $\sum \sin 2x \frac{\partial u}{\partial x} = 2$.

CHAPTER 6 – TEN MARKS QUESTIONS.

1. If $w = u^2 e^v$ where $u = \frac{x}{y}$, $v = y \log x$ find $\frac{\partial w}{\partial x}$ & $\frac{\partial w}{\partial y}$

2. (i) Using Euler's Theorem, prove that, $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}\tan u$, if $u = \sin^{-1}\left(\frac{x-y}{\sqrt{x}+\sqrt{y}}\right)$

(ii) Using Euler's Theorem, Prove that, $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \sin 2u$, If $u = \tan^{-1}\left(\frac{x^3+y^3}{x-y}\right)$

3. Verify Euler's Theorem for $f(x,y) = \frac{1}{\sqrt{x^2+y^2}}$

4. Verify $\frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$ for $u = \sin 3x \cos 4x$

5. Use differentials to find $y = \sqrt[3]{1.02} + \sqrt[4]{1.02}$

6. Trace the curves.(i) $y = x^3$ (ii) $y^2 = 2x^3$ (iii) $y = x^3 + 1$

CHAPTER 7 – SIX MARKS QUESTIONS.

1. Evaluate : $\int_0^{\pi/2} \log(\tan x)\,dx$

2. Evaluate : (i) $\int_{\pi/6}^{\pi/3} \frac{dx}{1+\sqrt{\cot x}}$ (ii) $\int_{\pi/6}^{\pi/3} \frac{dx}{1+\sqrt{\tan x}}$

3. Using second fundamental theorem on integrals, evaluate $\int_0^{\pi/2} \sin 2x \cdot \cos x\,dx$

4. Evaluate : $\int_0^1 x(1-x)^n\,dx$

5. Evaluate: $\int_0^1 x(1-x)^{10}\,dx$

6. **Evaluate :** $\int_0^1 x\, e^{-4x}\, dx$

7. Find the area of the region bounded by the line 3x–5y–15=0, x=1, x=4 and x-axis.

8. Find the area of the region bounded $y = 2x + 4$ **,** $y = 1, y = 3$ **and y-axis.**

9. Find the volume of the solid generated when the region enclosed by y=$\sqrt{x}$ **, y=2 and x=0 is revolved about y-axis.**

10. Find the area of the circle with radius a units.

11. Find the volume of the solid generated when the region enclosed by y=1+x^2, x=1, x=2, y=0 is revolved about the x-axis.

12. Find the volume of the solid generated when the region enclosed by 2ay^2=x(x–a)^2 is revolved about x-axis, a>0.

CHAPTER 7 – TEN MARKS QUESTIONS.

1. Find the area between the line y = x + 1 and the curve y = x^2 – 1.

2. Find the area of the region bounded by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

3. Find the area of the loop of the curve $3ay^2 = x(x-a)^2$ **,** $a > 0$

4. Find the perimeter of the circle with radius 'a' by using integration.

5. Prove that the curved surface area of a sphere of radius 'r' intercepted between two parallel planes at a distance 'a' and 'b' from the centre of the sphere is $2\pi r(b-a)$ **and hence deduce the surface area of the sphere.** $(b > a)$ **.**

6. Find the length of the curve $\left(\frac{x}{a}\right)^{\frac{2}{3}} + \left(\frac{y}{a}\right)^{\frac{2}{3}} = 1$

7. Find the volume of a right circular cone with radius 'r & height 'h

CHAPTER 8 – SIX MARKS QUESTIONS.

1. Solve: $\frac{dy}{dx} = 1 + x + y + xy$

2. Solve: $(x^2 - y)dx + (y^2 - x)dy = 0$, if it passes through the origin.

3. Solve: $\frac{dy}{dx} = \sin(x + y)$

4. $y\ dx + x\ dy = e^{-xy}\ dx$ **if it cuts the y-axis.**

5. Solve : $x\ dy - y\ dx = \sqrt{x^2 + y^2}\,dx$

6. Find the equation of the curve passing through (1,0) and which has slope $1 + \frac{y}{x}$ at (x,y)

7. Solve: $(D^2+9)y = \sin 3x$

8. Solve : $(D^2 - 3D + 2)y = x.$

9. Solve: $(D^2+1)y=0$ when $x=0$, $y=2$ and when $x=\pi/2$, $y=-2$

10. Solve: $(D^2-13D+12)y=e^{-2x}+5e^{x}$

11. Solve: $\frac{dy}{dx} = \frac{y}{x} + \tan\frac{y}{x}$

12. Solve. $\frac{dy}{dx} + y\cot x = 2\cos x$

CHAPTER 8 – TEN MARKS QUESTIONS.

1. Solve: (i)$(D^2+7D+12)y=e^{2x}$ (ii) $(D^2-1)y = \mathrm{Cos}2x - 2\mathrm{Sin}2x$

2. Radium disappears at a rate proportional to the amount present. It 5% of the original amount disappears in 50 years. How much will remain at the end of 100 years. [Take A_0 as the initial amt]

3. The rate at which the population of a city increases at any time is proportional to the population at that time. If there were 1,30,000 people in

the city in 1960 and 1,60,000 in 1990. What population may be anticipated in 2020. $[\log_e \left(16/13\right) = 0.2070\ ;\ e^{0.42} = 1.52]$

4. The sum of Rs.1000 is compounded continuously at the nominal rate of interest 4% per annum. In how many years will the amount be twice the original principle? ($\text{Log}_e\, 2 = 0.6931$)

5. A cup of coffee at temperature 100°C is placed in a room whose temperature is 15 °C and it cools to 60 °C in 5 minutes. Find its temperature after a further interval of 5 minutes.

6. Solve: $(x+y)^2 \frac{dy}{dx} = 1$

7. Solve: $(1+e^{x/y})dx + e^{x/y}(1 - x/y)dy = 0$ **given that y=1, where x=0.**

8. Solve: $(x^2 + y^2)dx + 3xydy = 0$

9. Solve: $dx + xdy = e^{-y}\sec^2 y\, dy$

CHAPTER 9 – SIX MARKS QUESTIONS.

1. Show that $[(\sim p)\vee(\sim q)]\vee p$ **is a tautology.**

2. Show that $p\to q$ **&** $q\to p$ **are not equivalent.**

3. State and prove cancellation laws on groups.

4. Prepare a truth table for $(p\vee q)\wedge(\sim q)$ **(ii)** $(p\wedge q)\vee(\sim(p\wedge q))$ **(iii)** $\sim(p\vee q) \equiv (\sim p)\wedge(\sim q)$ **(iv)** $((\sim p)\vee q)\vee(p\wedge(\sim p))$ **is a tautology.**

5. Show that $\sim(p\wedge q) = ((\sim p) \vee (\sim q))$

6. Prove that $(Z, +)$ **is an infinite Abelian group.**

7. Show that the cube roots of unity forms a finite abelian group under multiplication. Eg.9.14

8. Prove that (C,+) is an infinite Abelian group.

9. Show that (R–{0},⊙) is an infinite abelian group. Here ⊙ denotes usual multiplication.

CHAPTER 9 – TEN MARKS QUESTIONS.

1. Show that the set G of all positive rational forms a group under the composition * defined by $a * b = \frac{ab}{3}$ (∀a, b ∈G)

2. S.T the set of G of all rational numbers except –1 forms an Abelian group with respect to the operation * given by a ∗ b=a+b+ab, ∀a, b ∈G.

3. Prove that the set of four function f1,f2,f3,f4 on the set of non-zero complex numbers C – {0} defined by $f_1(z)=z,\ f_2(z)=-z, f_3(z)=\frac{1}{z},$ $f_4(z)=-\frac{1}{z}, \forall z \in C-\{0\}$ forms and Abelian group with respect to composition of functions.

4. Show that $(Z_7-\{[0]\}, \cdot_7)$ forms a group.

5. Show that the set $\{[1],[3],[4],[5],[9]\}$ forms an Abelian group under multiplication modulo 11.

6. Show that the set G of all matrices of the form $\begin{pmatrix} x & x \\ x & x \end{pmatrix}$ where $x \in R-\{0\}$ is a group under matrix multiplication.

7. Show that the set $G=\{a+b\sqrt{2}\ /\ a,b \in Q\}$ is an infinite abelian group with respect to addition.

8. Show that the set M of complex numbers z with the condition |z|=1 forms a group with respect to the operation of multiplication of complex numbers.

9. Show that the set $G=\{2^n\ /\ n \in Z\}$ is an abelian group under multiplication.

CHAPTER 10 – SIX MARKS QUESTIONS.

1. In a continuous distribution the p.d.f. of x is $f(x)=\begin{cases} \frac{3}{4}x(2-x), & 0<x<2 \\ 0 & , \text{otherwise} \end{cases}$ Find mean & variance of the distribution.

2. In a Poisson distribution if P(X=2)=P(X=3) find $P(X=5)$ [$e^{-3}=0.050$]

3. Find the probability mass function, and the cumulative distribution function for getting "3"'s when two dice are thrown.

4. A continuous random variable X has p.d.f f(x) = $3x^2$, $0\le x\le 1$. Find a and b such that (i) $P(X\le a) = P(X>a)$ and (ii) $P(X>b)=0.05$

5. Find the probability distribution of the number of 6 in throwing 3 dice once.

6 Find the expected value of the number on a die when thrown.

CHAPTER 10 – TEN MARKS QUESTIONS.

1. The number of accidents in a year involving taxi drivers in a city follows a Poisson distribution with mean equals to 3. Out of 1000 taxi drivers, find approximately the number of drivers with (i) no accident in a year, (ii) more than 3 accidents in a year. [e^{-3}=0.0498].

7. Obtain K, μ, σ^2 of the normal distribution whose probability distribution function is given by $F(x) = ke^{-2x^2+4x}$ $-\infty < x < \infty$

8. The total life time of 5 year old dog of a certain breed is a Random Variable whose distribution function is given by F(x)=$\begin{cases} 0 & , for\ x\le 5 \\ 1-\frac{25}{x^2} & , for\ x>5 \end{cases}$. Find the probability that such that a five year old dog will live (i) beyond 10 years (ii) less than 8 years (iii) anywhere between 12 to 15 years.