

Q-3

Attempt all questions

- a) Determine analytic function whose imaginary part is $e^x (x \cos y - y \sin y)$ (05)
- b) If $f(z) = u + iv$ is an analytic function of z and $u + v = e^x (\cos y + \sin y)$, find $f(z)$. (05)
- c) Find p such that the function $f(z) = r^2 \cos 2\theta + i r^2 \sin p\theta$ is analytic. (04)

Q-4

Attempt all questions

- a) Under the transformation $w = \frac{1}{z}$ (05)
- i. Find the image of $|z - 2i| = 2$.
- ii. Show that the image of the hyperbola $x^2 - y^2 = 1$ is the lemniscate $\rho^2 = \cos 2\theta$
- b) Find the bilinear transformation which sends the points $z = 0, 1, \infty$ in to the points $w = -5, -1, 3$ respectively. What are the invariant points of the transformation? (05)

- c) Following table gives the values of x and y : (04)

x	1.0	1.05	1.10	1.15	1.20	1.25	1.30
y	1.00	1.02470	1.04881	1.07238	1.09544	1.11803	1.14017

Find $\frac{dy}{dx}$ for $x = 1.05$ using forward difference.

Q-5

Attempt all questions

- a) Solve by Gauss – Jordan method (05)
- $$5x - 2y + 3z = 18, \quad x + 7y - 3z = -22, \quad 2x - y + 6z = 22.$$
- b) Solve the equation (05)
- $$27x + 6y - z = 85, \quad 6x + 5y + 2z = 72, \quad x + y + 54z = 110$$
- by Gauss – Seidel method.
- c) If $\vec{F} = (x + y + 1)i + j - (x + y)k$ find $\vec{F} \cdot \text{curl } \vec{F}$. (04)

Q-6

Attempt all questions

- a) Verify Green's theorem for the function $\vec{F} = (x + y)i + 2xyj$ and C is the rectangle in XY – plane bounded by $x = 0, y = 0, x = a, y = b$. (07)
- b) Verify Stokes's theorem for $\vec{A} = (2x - y)i - yz^2j - y^2zk$, where S is the upper half surface of sphere $x^2 + y^2 + z^2 = 1$ and C is its boundary. (07)

Q-7

Attempt all questions

- a) Use the fourth – order RungeKutta method to solve $\frac{dy}{dx} = y - \frac{2x}{y}, y(0) = 1$. (05)
- Evaluate the value of y when $x = 0.1$
- b) Find the value of y for $x = 0.1$ by Picard's method, given that (05)



$$\frac{dy}{dx} = \frac{y - x}{y + x}, y(0) = 1$$

- c) Following table gives the values of x and y : (04)

x	30	35	40	45	50
y	15.9	14.9	14.1	13.3	12.5

Find value of x corresponding to $y = 13.6$

Attempt all questions (14)

- a) Construct Newton's forward interpolation polynomial for the following data: (05)

X	4	6	8	10
Y	1	3	8	16

Use it to find the value of y for $x = 5$.

- b) Use Lagrange's interpolation formula to find the value of y when $x = 10$, if the values of x and y are given below: (05)

x	5	6	9	11
y	12	13	14	16

- c) Divide the range into 10 equal parts, find the approximate value of $\int_0^{\pi} \sin x \, dx$ by Simpson's $\frac{1}{3}$ rule. (04)

Q-8

