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**UNIVERSITY DEPARTMENT OF MATHEMATICS**  
**Tilka Manjhi Bhagalpur University, Bhagalpur**

PAPER – VI

ASSIGNMENT – I

Complex Analysis

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1. Problems on parametrization of curve

(a) Parametrization of linear paths with given points

- i. 0 to  $2 + 3i$
- ii.  $1 + i$  to  $2 - i$
- iii.  $-1 - i$  to  $2 + 3i$
- iv. 2 to  $2 + 2i$

(b) Parametrization of circular paths

- i. Circle centered at 0 from 1 to  $i$
- ii. Circle centered at  $1 + i$  with radius 2.
- iii. Circle centered at origin of radius 3.

(c) Find the parametrization of the curve  $y = x^2$  from 0 to 1.

2. Problem of contour integration

(a) Find  $\int_{\gamma} (x^2 - iy^2) dz$  along

- i. The parabola  $y = 2x^2$  from (1, 2) to (2, 8).
- ii. The straight lines from (1, 1) to (1, 8) and (1, 1) to (2, 8)
- iii. The straight line from (1, 1) to (2, 8)

(b) Find  $\int_{\gamma} |z|^2 dz$  along the square with vertices at (0, 0), (1, 0), (1, 1), (0, 1).

3. Problem on path independence

(a) Evaluate the following integrals along any part from  $1 + i$  to  $2i$

- i.  $\int_{\gamma} (5z^4 - z^3 + 2) dz$
- ii.  $\int_{\gamma} \sin z dz$
- iii.  $\int_{\gamma} e^z dz$
- iv.  $\int_{\gamma} \frac{1}{z^2} dz$

4. Problem on Cauchy's theorem

(a)  $\int_{\gamma} \frac{1}{z}$  along the circular paths  $|z - 1 - i| = 1$  in anticlockwise direction.

(b) Find the following integration along  $\gamma : |z| = 3$

- i.  $\int_{\gamma} (5z^4 - z^3 + 2) dz$
  - ii.  $\int_{\gamma} \sin z dz$
  - iii.  $\int_{\gamma} e^z dz$
  - iv.  $\int_{\gamma} \frac{1}{(z - 4)^2} dz$
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