

- 1) Question No. 1 is Compulsory.
- 2) Answer any THREE questions from Q.2 to Q.6.
- 3) Figures to the right indicate full marks.

(a) Verify Cauchy-Schwartz inequality for  $u = (2, 1, -3)$   $v = (3, 4, -2)$ . (5)

Also find angle between  $u$  &  $v$ .

(b) If  $A = \begin{bmatrix} 2 & 0 & 0 \\ 5 & -1 & 0 \\ 2 & 3 & 3 \end{bmatrix}$  find Eigen values of  $A^2 + 6A^{-1} - 3I$ . (5)

(c) Evaluate  $\int_C \frac{z^3+2z}{(z-1)^2} dz$  when  $C$  is  $|z| = 2$ . (5)

(d) Find the extremals of  $\int_1^2 (x+y)y' dx$ . (5)

2 (a) Verify Cayley-Hamilton theorem & hence find  $A^{-1}$ , where  $A =$  (6)

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

(b) Find the extremal of  $\int_1^2 (2xy - y'^2) dx$ . (6)

(c) Obtain Laurent's series expansion of  $f(z) = \frac{z+2}{(z-3)(z-4)}$  about (8)

3 (a) Evaluate  $\int_0^1 \frac{z^2}{z^2+1} dz$  along the parabola  $x = y^2$ . (6)

(b) Show that  $A = \begin{bmatrix} 6 & -2 & 3 \\ 2 & 3 & 2 \\ -1 & 3 & 1 \end{bmatrix}$  is derogatory & find its minimal polynomial. (6)

(c) Reduce the following quadratic form into canonical form & hence find its rank, index, signature & value class (8)

$$x^2 + 2y^2 + 3z^2 + 2yz + 2xy - 2zx.$$

