

N.B. (1) Question No. 1 is **COMPULSORY**.

(2) Answer **ANY THREE** questions from Q.2 to Q.6.

(3) Use of Statistical Tables permitted.

(4) Figures to right indicate full marks.

Q 1

- a. Evaluate the complex line Integral $\int_0^{1+i} (x - y + ix^2) dz$ along the straight line from $z=0$ to $z=1+i$ 5
- b. Find a vector orthogonal to $u=(-6, 4, 2)$ $v=(3, 1, 5)$ 5
- c. The equations of lines of regressions are $2x+3y+8=0$ and $x+2y-5=0$, find means of x and y and coefficient of line of regression between x and y 5
- d. Let W be the set of 2×2 matrices of the form $\begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix}$ where a and b are real numbers, Show that W is a subspace of space V of all 2×2 matrices. 5

Q 2

Find the Spearman's rank coefficient correlation of the following data 6

a.

X	32	55	49	60	43	37	43	49	10	20
Y	40	30	70	20	30	50	72	60	45	25

- b. Find the extremal of $\int_{x_1}^{x_2} \frac{1+y^2}{y^2} dx$ 6
- Obtain Taylor and Laurent series expansion about $z=0$ of function 8
- c. $f(z) = \frac{z-1}{z^2-2z-3}$ indicating regions of convergence

Q. 3

- a. A continuous random variable has probability density function as $f(x) = kx^2$ $0 \leq x \leq 2$, find k , mean and $P(0.2 < x < 0.5)$ 6
- b. $\oint_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-2)(z-3)} dz$ where C is the circle i. $|z|=1$ ii. $|z|=4$ 6
- c. Reduce the quadratic form to canonical form, find its rank and signature $21x_1^2 + 11x_2^2 + 2x_3^2 - 30x_1x_2 + 12x_1x_3 - 8x_2x_3$ 8

- Q 4**
- a. Using Gram-Schmidt process, construct, an orthonormal basis of $(1, 1, 1)$, $(-1, 1, 0)$ and $(1, 2, 1)$ in R^3 have Euclidian inner product **6**
 - b. Find the probability that at most 4 defective bulbs will be found in a box of 200 bulbs, if it is known that 2% of the bulbs are defective **6**
 - c. By Rayleigh -Ritz method, Solve the boundary value problem **8**
 $y''+y+x=0 \quad 0 < x < 1 \quad y(0)=y(1)=0$

- Q 5** Ten students got the following percentage of marks in mathematics and statistics **6**

Maths	78	36	98	25	75	82	90	62	65	39
Stats	84	51	91	60	68	62	86	58	53	47

- a. Calculate the coefficient of correlation. **6**
- b. In a normal distribution 7% of the items are below 35 and 89% of the items are below 63. Find the mean and standard deviation **6**
- c. Find the extremal of $\int_{x_1}^{x_2} (y''^2 - y^2 + x^2) dx$ **8**

- Q 6** a. Verify Cauchy -Schwartz inequality for $u=(1, 2, 4)$ and $v= (-3, 2, 5)$ **6**

b. Evaluate $\oint_C \frac{\sin^6 z}{\left(z - \frac{\pi}{6}\right)^3} dz$ where C is a circle $|z|=2$ **6**

- c. Find Singular value decomposition of $\begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$ **8**
