(3 Hours) Total Marks: 80

Note: 1) Question no 1 is compulsory.
2) Attempt any 3 question out of remaining.
3) Each question carries 20 Marks.
4) Figures to right indicate full marks.

Q.1 a) Calculate the coefficient of correlation between x and y from the following data: [5]
N=10, $\sum x = 140$, $\sum y = 150$, $\sum(x-10)^2 = 180$, $\sum(y-15)^2 = 215$ and $\sum(x-10)(y-15) = 60$

b) Evaluate $\oint_c \ logzdz$ where c is the circle with centre at origin and radius 1. [5]

c) Find the projection of $u = (3,0,4)$ along and perpendicular to $v = (2,3,3)$ [5]

d) Find the eigen values of $3A^2 - 2A + 5I$ where $A = \begin{bmatrix} 1 & -2 & 3 \\ 0 & 3 & 2 \\ 0 & 0 & 2 \end{bmatrix}$ [5]

Q.2 a) Find the extremals of $\int_{x_1}^{x_2}(1 + x^2y')y'dx$ [6]

b) Using Gram-Schmidt process, transform the basis $\{v_1, v_2, v_3\}$ into orthogonal basis where $v_1 = (1,0,0)$, $v_2 = (3,7,-2)$, $v_3 = (0,4,1)$. [6]

c) Show that $A = \begin{bmatrix} 1 & -6 & -4 \\ 0 & 4 & -2 \\ 0 & -6 & -3 \end{bmatrix}$ is diagonalisable and hence find the transforming matrix and diagonal form of A. [8]

Q.3 a) For a normal variable x, with mean 10 and standard deviation 4, find (i) P(|x-14| < 1) and (ii) P(x ≤ 12) [6]

b) Fit a binomial distribution for the following data [6]

x:	0	1	2	3	4	5	6
Frequency:	5	18	28	12	7	6	4

c) Using Rayleigh-Ritz Method find the solution of $I = \int_0^1(2xy - y^2 - y'^2)dx$ where $0 \le x \le 1$ and y(0)=y(1)=0. [8]

Q.4 a) Find the lines of regression for following data [6]

x:	5	6	7	8	9	10	11
y:	11	14	14	15	12	17	16

b) If $f(\propto) = \oint_c \frac{3z^2-z+5}{z-\propto} dz$ where C is the circle $|z| = 3$ then find f(1), f \`(-1), f \`\`(-i), [6]

c) Check whether the set of pairs of real numbers of the form $(1, u)$ with operations $(1,u) + (1,v) = (1, u + v)$ and $k(1,u) = (1, ku)$ is a vector space. [8]

Q.5 a) Find the value of k such that $f(x) = \begin{cases} k(1-x^2) & 0 < x < 1 \\ 0 & otherwise \end{cases}$ is a probability function and hence find P(0.1 < x < 0.2) and P(x > 0.5) [6]

b) If $A = \begin{bmatrix} -1 & 4 \\ 2 & 1 \end{bmatrix}$ then show that $3.tanA = A.tan3$ [6]

c) Find all possible expansions of $f(z) = \frac{1}{(z-1)(z-2)}$. [8]

Q.6 a) Evaluate $\int_0^{2\pi} \frac{cos3\theta}{5+4cos\theta} d\theta$ using Cauchy Residue Theorem. [6]

b) Show that the matrix $A = \begin{bmatrix} 2 & -2 & 3 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$ is non-derogatory. [6]

c) Find the m.g.f. of Poisson's Distribution about origin. Hence find its mean and variance [8]

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