Hours: 3 hrs Marks: 80

Note: 1. Question no**. 1** is compulsory.
2. Attempt any **three** questions out of remaining **five** questions.

Q.1.[a] Given two lines of regression lines $6y = 5x + 90,\ 15x = 8y + 130.$ [5]
Find (i) $\bar{x},\ \bar{y}$ (ii) correlation coefficient r.

[b] Show that $(41|(2^{20} - 1))$. [5]

[c] A random discrete variable x has the probability density function given [5]

x	-2	-1	0	1	2	3
P(x)	0.2	k	0.1	2k	0.1	2k

Find (i) k (ii) E(X) (iii) V(X).

[d] Show that $G = \{1, -1, i, -i\}$ is a group under usual multiplication of complex number. [5]

Q.2.[a] Find gcd (2378, 1769) using Euclidean Algorithm. Also find x and y such that $2378x + 1769y = \gcd(2379,1769)$. [6]

[b] Give an example of a graph which has [6]
(i) Eulerian circuit but not a Hamiltonian circuit
(ii) Hamiltonian circuit but not an Eulerian circuit
(iii) Both Hamiltonian circuit and Eulerian circuit

[c] Show that $(D_{10}, \leq)$ is a lattice. Draw its Hasse diagram. [8]

Q.3.[a] Derive mgf of Binomial distribution and hence find its mean and variance. [6]

[b] It was found that the burning life of electric bulbs of a particular brand was normally distributed with the mean 1200 hrs and the S.D. of 90 hours, Estimate the number of bulbs in a lot of 2500 bulbs having the burning life: (i) more than 1300 hours (ii) between 1050 and 1400 hours. [6]

[c] **(i)** Find inverse of $8^{-1} \pmod{77}$ using Euler's theorem. [8]
(ii) Find the Jacobi's symbol of $\left(\frac{32}{15}\right)$.

Q.4.[a] Calculate the coefficient of correlation between x and y from the following data [6]

x	23	27	28	29	30	31	33	35	36	39
y	18	22	23	24	25	26	28	29	30	32

[b] Let G be a group of all permutations of degree 3 on 3 symbols 1, 2 & 3. [6]
Let H ={I, (1 2)} be a subgroup of G. find all the distinct left cosets of H in G and hence index of H.

[c] **(i)** The average marks scored by 32 boys is 72 with standard deviation of 8 while that for 36 girls is 70 with standard deviation of 6. Test at 5% LOS whether the boys perform better than the girls. [8]

(ii) A random sample of 15 items gives the mean 6.2 and variance 10.24. Can it be regarded as drawn from a normal population with mean 5.4 at 5% LOS?

Q.5.[a] Solve $x \equiv 1(\text{mod } 3),\ x \equiv 2(\text{mod } 5),\ x = 3\ (\text{mod } 7)$. [6]

[b] Given L = {1, 2, 4, 5, 10, 20}with divisibility relation. Verify that $(L, \leq)$ is a distributive but not complimented Lattice. [6]

[c] **(i)** Draw a complete graph of 5 vertices. [8]

(ii) Give an example of tree. (sketch the tree).

Q.6.[a] Show that $111^{333} + 333^{111}$ is divisible by 7. [6]

[b] The following table gives the number of accidents in a city during a week Find whether the accidents are uniformly distributed over a week. [6]

Day	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Total
No. of accidents	13	15	9	11	12	10	14	84

[c] **(i)** Write the following permutation as the product of disjoint cycles [8]

$f = (1\ 3\ 2\ 5)\ (1\ 4\ 5)\ (2\ 5\ 1)$.

(ii) Simplify as sum of product (A+B) (A+B′) (A′+B) (A′+B′).

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