



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

Q.1.[a] A random discrete variable x has the probability density function given

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

[5]

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

- [b] Find smallest positive integer modulo 5, to which $3^2, 3^3, 3^4, 3^{10}$ is congruent. [5]
 [c] Given two lines of regression lines $6y = 5x + 90$, $15x = 8y + 130$. Find (i) \bar{x} , \bar{y} (ii) correlation coefficient r . [5]
 [d] Show that $G = \{1, -1, i, -i\}$ is a group under usual multiplication of complex number. [5]
- Q.2.[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
 $f = (1\ 3\ 2\ 5)(1\ 4\ 5)(2\ 5\ 1)$. [8]
 (ii) Simplify as sum of product $(A+B)(A+B')(A'+B)(A'+B')$.

- Q.3.[a] Find $\gcd(2378, 1769)$ using Euclidean Algorithm. Also find x and y such that $2378x + 1769y = \gcd(2378, 1769)$. [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.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 . Let $H = \{(1\ 2)\}$ be a subgroup of G , find all the distinct left cosets of H in G and hence index of H . [6]
 [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] 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.6.[a] Solve $x \equiv 1 \pmod{3}$, $x \equiv 2 \pmod{5}$, $x \equiv 3 \pmod{7}$. [6]
- [b] Given $L = \{1, 2, 4, 5, 10, 20\}$ with divisibility relation. Verify that (L, \leq) is a distributive but not complemented Lattice. [6]
- [c] (i) Draw a complete graph of 5 vertices. [8]
 (ii) Give an example of tree. (sketch the tree).