

Total Marks: 80

Hours: 3 hrs

Note: 1. Question no. 1 is compulsory.

2. Attempt any **three** questions out of remaining **five** questions.

Q1. (a) Find the remainder when 2^{50} is divided by 7. (05)

(b) The probability distribution function of random variable X is (05)

X	0	1	2	3	4	5	6
P(X=x)	k	3k	5k	7k	9k	11k	13k

Find $P(x < 4)$, $P(3 < x < 6)$.

(c) Calculate rank correlation coefficient from the following data. (05)

Marks in Paper I : 40, 42, 45, 35, 36, 39

Marks in Paper II : 46, 43, 44, 39, 40, 43

(d) Draw the Hasse diagram of Poset $A = \{2, 3, 6, 12, 24, 36, 72\}$ under the relation of divisibility. Is it Lattice? (05)

Q2. (a) If x is a Poisson variate such that $P(x=2) = 9P(x=4) + 90P(x=6)$ then Find mean of x. (06)

(b) Consider (3,4) parity check code. For each of the following received words determine whether an error will be detected?

(i) 0010 (ii) 1001 (iii) 1101 (iv) 1111 (06)

(c) (i) Using Sieve of Eratosthenes find the prime number upto 150. (04)

(ii) What is the remainder when following sum divided by 4? (04)

$$1^5 + 2^5 + 3^5 + \dots + 100^5$$

Q3. (a) Prove that a graph 'G' remains connected after removing an edge 'e' from 'G' iff 'e' is in some circuit of G. (06)

(b) Marks obtained by students in an examination follow normal distribution. If 30% of students got below 35 marks and 10% got above 60 marks, Find mean and standard deviation. (06)

(c) Investigate the association between the darkness of eye colour in father and son from the following data. (08)

		Colour of the father's eye		
		Dark	Not dark	Total
Colour of the Son's eyes	Dark	48	90	138
	Not Dark	80	782	862
	Total	128	872	1000

Q4. (a) Using Euclid 's Algorithm find x and y satisfying the following. (06)
 $\gcd(-306, 657) = 306x + 657y$.

(b) Let $L = \{1, 2, 3, 5, 6, 10, 15, 30\}$ with divisibility relation. Then show that L is a
 Complimented Lattice. (06)

(c) Give an example of a graph which has (08)
 (1) Eulerian circuit but not a hamiltonian circuit.
 (2) Hamiltonian circuit but not an Eulerian circuit
 (3) Both
 (4) None of these two

Q5. (a) Fit Binomial Distribution to the following data (06)

X :	0	1	2	3	4
Frequency :	12	66	109	59	10

(b) Nine items of a sample had the following values 45, 47, 50, 52, 48, 47, 49, 53, 51.
 Does the mean of 9 items differ significantly from assumed population mean 47.5? (06)

(c) Solve $x \equiv 1 \pmod{3}, x \equiv 2 \pmod{5}, x \equiv 3 \pmod{7}$ (08)

Q6. (a) Given $6y = 5x + 90$, $5x = 8y + 30$, $\sigma_x^2 = 16$ (06)
 Find (i) \bar{x} and \bar{y} (ii) r (iii) σ_y^2

(b) Prove that set of cube root of unity is a group under multiplication of complex
 number. (06)

(c) (i) Prove that $111^{333} + 333^{111}$ is divisible by 7. (04)

(ii) Find $5^{-1} \pmod{23}$ (04)