

[Time: 3 Hours]

[ Marks:80]

Please check whether you have got the right question paper.

- N.B:** 1. Q.1 is compulsory  
2. Attempt any three out of remaining five question  
3. Rights indicate full marks.

1. a. Find greatest common divisor of the following pairs of integer, using Euclidean algorithm. **05**  
(3083, 2893)
- b. Given two lines regression **05**  
 $6y = 5x + 90, 15x = 8y + 130, \sigma_x^2 = 16$   
Find (i)  $\bar{x}$  and  $\bar{y}$  (ii) Find r
- c. Prove that  $A = \{1, 2, 3, 4, 5, 6\}$  is a finite abelian group under multiplication modulo 7 **05**
- d. A random variable x has the following probability function **05**
- |      |   |    |    |       |         |        |        |
|------|---|----|----|-------|---------|--------|--------|
| x:   | 1 | 2  | 3  | 4     | 5       | 6      | 7      |
| p(x) | K | 2K | 3K | $K^2$ | $K^2+k$ | $2K^2$ | $4K^2$ |
- Find (I) k (II) p (x<5)
2. a. Calculate coefficient of correlation between x and y **06**
- |    |   |   |   |   |   |
|----|---|---|---|---|---|
| x: | 3 | 6 | 4 | 5 | 7 |
| y: | 2 | 4 | 5 | 3 | 6 |
- b. A random sample of size 16 from a normal population. Showed a mean of 103.75 cm and sum of squares of deviation from the mean  $843.75 \text{ cm}^2$  can we say that the population has mean of  $108.75 \text{ cm}$ ? **06**
- c. Prove that  $G = \{1, -1, i, -i\}$  is a group under usual multiplication of complex numbers. **08**
3. a. Draw Hasse diagram for  $(D_{75}, \leq)$ , check whether it is a lattice **06**
- b. Out of 1000 families of 3 children each how many would you expect to have 2 boys and 1 girl? **06**
- c. i. Find last digit of base 7 expansion of  $3^{100}$  i.e.  $3^{100} \pmod{7}$  by using Fermat's theorem **08**  
ii. Find the Legendre's symbol  $\left(\frac{19}{23}\right)$
4. a. Can a complete graph with 8 vertices have 40 edges excluding self-loop **06**
- b. Find remainder when  $2^{50}$  and  $41^{65}$  are divisible by 7 **06**

- c. Investigate the association between darkness of eye colour in father and son from the following data **06**

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

5. a. Let  $L = \{1, 2, 3, 4, 12\}$  and the relation be "is divisible by" write compliments of L **06**
- b. If  $x$  is a Poisson variate and  $p(x=0) = 6 p(x=3)$  Find  $P(x=2)$  **06**
- c. Define the following terms giving illustration **08**

1.	Simple graph	2.	Complete graph
3.	Bipartite graph	4.	Planar graph

6. a. Solve  $x \equiv 1 \pmod{5}$   
 $x \equiv 2 \pmod{6}$   
 $x \equiv 3 \pmod{7}$  **06**
- b. A certain injection administered to 12 patients resulted in following changes of blood pressure (5, 2, 8, -1, 3, 0, 6, -2, 1, 5, 0, 4) can it be concluded that injection will be in general accompanied by an increase in blood pressure? **06**

- c. i. Write the following permutation as product of disjoint cycles **08**  
 $f = (1\ 3\ 2\ 5)(1\ 4\ 5)(2\ 5\ 1)$
- ii. simplifies sum of product  
 $(A+B)(A+B^1)(A^1+B)(A^1+B^1)$

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