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**GIET UNIVERSITY, GUNUPUR – 765022**

M. Tech (First Semester – Regular) Examinations, June – 2021  
**MPCCS1010- MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE (CSE)**

Time: 2 hrs

Maximum: 50 Marks

**The figures in the right hand margin indicate marks.**

**PART – A**

**(2 x 10 = 20 Marks)**

Q1. Answer **ALL** questions

- Define Mathematical Expectation
- State Central Limit theorem
- Define Unbiased Estimator
- State Neymann’s Criterion for a sufficient Estimator
- Explain Scatter Diagram
- Write a note on classification problem.
- Define Eulerian Graph
- Check whether  $K_5$  Complete graph with 5 vertices is planar or not.
- Define Equivalence Relation.
- Find the number of distinct symmetries of hexagon.

**PART – B**

**(6 x 5 = 30 Marks)**

Answer ANY FIVE questions

**Marks**

- The probability mass function is of a R.V X is given by  $P(X = r) = \frac{k}{2^r}, r = 1,2,3 \dots$  (6)  
 i) Find the value of “k”. ii) The mean and variance of X.
- Consider the following joint probability densityfunction of the random variables X and Y : (6)

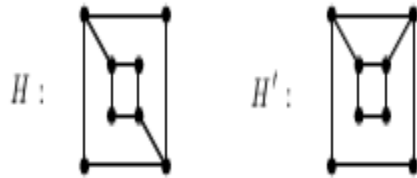
$$f(x, y) = \begin{cases} kxy e^{-(x^2 + y^2)} , & x > 0, y > 0, \\ 0, & elsewhere \end{cases}$$

- Find the marginal density functions of X.
  - Find the marginal density function of Y.
  - Are X and Y independent?
- Find the maximum likelihood estimator of the parameter  $\theta$  in the population given by (6)  
 $f(x, \theta) = \frac{1}{\theta^p} \frac{x^{p-1} e^{-\frac{x}{\theta}}}{\Gamma(p)} x \geq 0$ , and p is known. Also find its variance.
  - Consider an arithmetic unit of a computer system with a modulo-m online fault detector. (6)  
 As the modulus m varies, the average detection latency y also varies. Given the following data,

<i>m</i>	<i>y</i>
3	1.45
5	1.30
7	1.20
11	1.10
13	1.05

Determine parameters a and b by performing a least-squares fit of the curve  $y = am^b$  to the given data and also find the co efficient of determination.

6 Verify whether the following graphs are isomorphic or not (6)



7. Let A be the adjacency matrix of a simple graph G, where (6)

$$A = \begin{matrix} & \begin{matrix} v_1 & v_2 & v_3 & v_4 & v_5 & v_6 & v_7 \end{matrix} \\ \begin{matrix} v_1 \\ v_2 \\ v_3 \\ v_4 \\ v_5 \\ v_6 \\ v_7 \end{matrix} & \begin{pmatrix} 0 & 1 & 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 & 1 & 1 & 1 \\ 1 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 & 0 & 0 \end{pmatrix} \end{matrix}$$

Find the chromatic number and covering number of G.

8. Suppose a necklace can be made from beads of three colors—black, white, and red. (6)  
How many different necklaces with n beads are there?

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