

GUJARAT TECHNOLOGICAL UNIVERSITY**ME – SEMESTER –I-(New) EXAMINATION – SUMMER 2019****Subject Code: 3710214****Date: 08/05/2019****Subject Name: Mathematical foundations of Computer Science****Time: 02:30 PM TO 05:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a) I.** To infer the average strength of some product A, a sample of size of 80 is taken from the entire lot of that product. The sample mean is $\bar{x} = 18.85$ with sample variance $s^2 = 30.77$. Construct a 99% confidence interval for the product's true average strength. **04**
- II.** In how many ways can a group of eight people be divided into committees, subject to the constraint that each person must belong to exactly one committee, and each committee must contain at least two people? **03**
- (b)** The specifications for a certain kind of ribbon call for a mean breaking strength of 180 pounds. If five pieces of the ribbon (randomly selected from different rolls) have a mean breaking strength of 169.5 pounds with a standard deviation of 5.7 pounds, test the null hypothesis $\mu = 180$ pounds against the alternative hypothesis $\mu < 180$ pounds at the 0.01 level of significance. Assume that the population distribution is normal. **07**
- Q.2 (a) I.** Is $f(x) = \frac{x+1}{25}$, $x = 1, 2, 3, 4, 5$ define probability distribution? Justify your answer. **01**
- II.** A company claims that 90% of the CPU, given to company's employees is with high speed processors. Find the probabilities that among 18 CPU selected at random,
- a. All 18 are of high speed processor.
 - b. At least 16 are with high speed processor.
 - c. At most 14 are with high speed processor.
- III.** If 20% of the memory chips made in a certain plant are defective. Use Normal approximation to the Binomial Distribution to find the probabilities that in a lot of 100 randomly chosen for inspection
- a. At most 15 will be defective;
 - b. Exactly 15 will be defective? **03**
- (b)** Use the following data to find the multiple linear regression $y = a_0 + a_1 x_1 + a_2 x_2$ using least square method. **07**
- | | | | | | | |
|------------------|---|----|-----|---|---|----|
| y: | 5 | 10 | 9 | 0 | 3 | 27 |
| x ₁ : | 0 | 2 | 2.5 | 1 | 4 | 7 |
| x ₂ : | 0 | 1 | 2 | 3 | 6 | 2 |
- OR**
- (b)** Explain regression and classification in details. **07**

- Q.3 (a)** I. Explain Vertex coloring and Region coloring. What is the chromatic number of K_n . **04**
 II. Describe the three Utilities problem. Is it a planar graph? Justify. **03**
- (b)** I. If two random variables have the joint density **04**

$$f(x, y) = \begin{cases} x_1 x_2, & \text{for } 0 < x_1 < 2, 0 < x_2 < 1, \\ 0 & \text{elsewhere} \end{cases}$$

find the probabilities that

- a. Both random variables will take on a values less than 1
 b. The sum of the values taken by the two random variables will be less than 1. **03**
- II. A professor tries not to be late for class too often. If he is late one day, he is 90 per cent sure to be on time next time. If he is on time then the next time there is a 30 per cent chance of his being late. In the long run, how often is he late for class?

OR

- Q.3 (a)** I. Define the following terms: null-graph, isolated vertex, complete graph, Euler circuit. **04**
 II. Define an isomorphism between two graphs. Write the conditions under which two graphs cannot be isomorphic. **03**

- (b)** I. On January 1 (this year), Bakery A had 40 per cent of its local market share while the other two bakeries B and C had 40 per cent and 20 per cent, respectively, of the market share. Based upon a study by a marketing research firm, the following facts were compiled. Bakery A retains 90 per cent of its customers while gaining 5 per cent of B's customers and 10 per cent of C's customers. Bakery B retains 85 per cent of its customers while gaining 5 per cent of A's customers and 7 per cent of C's customers. Bakery C retains 83 per cent of its customers and gains 5 per cent of A's customers and 10 per cent of B's customers. What will each firm's market share be on January 1 next year and what will each firm's market share be at equilibrium? **04**

- II. If measurements of the length and the width of a rectangle have the joint density **03**

$$f(x, y) = \begin{cases} \frac{1}{ab}, & \text{for } L - \frac{a}{2} < x < L + \frac{a}{2}, W - \frac{b}{2} < y < W + \frac{b}{2}, \\ 0 & \text{elsewhere} \end{cases}$$

find the mean of the corresponding distribution of the area of the rectangle.

- Q.4 (a)** I. Show that K_5 is nonplanar. **04**
 II. How many different 8-digit binary sequences are there with six 1s and two 0s? **03**
- (b)** Explain the problem of over fitting model assessment in details. **07**

OR

- Q.4 (a)** Explain OSI model in details. **07**
(b) Explain various application of data mining. **07**

- Q.5 (a)** Explain any three Scheduling algorithm of operating system. **07**
(b) Explain Waterfall model and Incremental model of software engineering. **07**

OR

- Q.5** (a) What is Web Analytics? Explain outcomes of web analytics.
(b) Explain significance of Mathematics in Machine learning.

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