

Enrollment No./ Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY

MASTER OF ENGINEERING - SEMESTER - 1 EXAMINATION – SUMMER 2026

Subject Code: 3710214

Date: 09-06-2026

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) Explain the problem of over fitting model assessment in details. **07**
(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) Write a short note on mathematical tools of Soft Computing. **07**
(b) What is bioinformatics? What is the role of probability distribution in bioinformatics? **07**

OR

- (b) Four losses are observed from a Gamma distribution. The observed losses are 200, 300, 350 and 450. Find a method of moments estimate for α . **07**

- Q.3** (a) If the probability that an individual suffer a bad reaction from a certain injection is 0.001, determine the probability that out of 2000 individuals:
1) Exactly 3 2) more than 2 individuals 3) None 4) More than 1 individual will suffer a bad-reaction. **07**
(b) What is the significance of Method of moments in statistics? Consider Following sample data follows binomial distribution $[b(x; n, P) = n * P^X * (1 - P)^{n - X}]$. Estimate the value of n and p using method of moments?
2, 3, 2, 0, 1, 3, 3, 3, 3, 1, 3, 3, 3, 2, 1 **07**

OR

- Q.3** (a) Find the value of c and CDF of x if a Random variable X has the PDF f(x) given by $f(x) = cx, x > 0$
 $0, x \leq 0$ **07**
(b) Assume a random variable X denotes the no of neurons in an experiment on a human brain. If the random variable X takes the values 1, 2, 3 and 4 such that $2P(X=1)=3P(X=2)=P(X=3)=5P(X=4)$, find the probability distribution function and cumulative distribution function of X. **07**

- Q.4 (a)** I. Show that K5 is nonplanar. **07**
II. How many different 8-digit binary sequences are there with six 1s and two 0s?
- (b)** I. Define the following terms: null-graph, isolated vertex, complete graph, Euler circuit. **07**
II. Define an isomorphism between two graphs. Write the conditions under which two graphs cannot be isomorphic.
- OR**
- Q.4 (a)** Explain Waterfall model and Incremental model of software engineering. **07**
(b) Explain OSI model in details. **07**
- Q.5 (a)** How mathematical concepts are being used to implement security algorithms? Explain in detail. **07**
(b) Explain regression and classification in details. **07**
- OR**
- Q.5 (a)** Solve the following crime problem with graph theory: **07**
4 people named as A B C and D are being investigated. Only one person is telling the truth. From the statements of these 4 find out who is the thief.
1) A says " I 'm not the thief"
2) B says " A is the thief"
3) C says " I 'm not the thief"
4) D says "B is the thief".
- (b)** Explain any three Scheduling algorithm of operating system. **07**