Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER– 1 • EXAMINATION – WINTER - 2023

Subject Code:3710214 Date: 23 Jan 2024

Subject Name:Mathematical foundations of Computer Science

Time:10:30 AM TO 01:00 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)** The length of time, in minutes, that a customer queues in a Post Office is a random variable T ,with probability density function **07**

$$f(t) = \begin{cases} c(81 - t^2) & 0 \le t \le 9 \\ 0 & Otherwise \end{cases}$$

Where c is a constant,

1. Find the value of c.
2. Find cumulative distribution function F(t).

(b) The probability is 0.02 that an item produced by a factory is defective. A shipment of 10,000 items is sent to its warehouse. Find the sum of the expected number of defective items and the standard deviation. **07**

Q.2 **(a)** A random variable x has the following probability distribution. **07**

X=x	-2	-1	0	1	2	3
P(x)	0.1	k	0.2	2k	0.3	k

Find the value of k & calculate mean and variance of x.

(b) Random samples of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favour of the proposal. Test the hypothesis that proportions of men and women in favour of the proposal are same at 5% level. **07**

OR

(b) The guaranteed average life of a certain type of electric light bulbs is 1000 hours with a standard deviation of 125 hours.It is proposed to sample the output so as to assure that 90% of the bulbs do not fall short of the guaranteed average by more than 2.5%. What should be the minimum size of the sample? (The area under standard normal curve from to is 0.4) **07**

Q.3 **(a)** Out of 800 families with 5 children each, how many would you expect to have **07**

(i) 3 boys
(ii) 5 girls
(iii) Either 2 or 3 boys

Assume equal probabilities for boys and girls.

(b) Define following terms: **07**

1. Walk
2. Eular Path
3. Hamilton Path
4. Sub Graph
5. Circuit
6. Complete Graph
7. Planer Graph

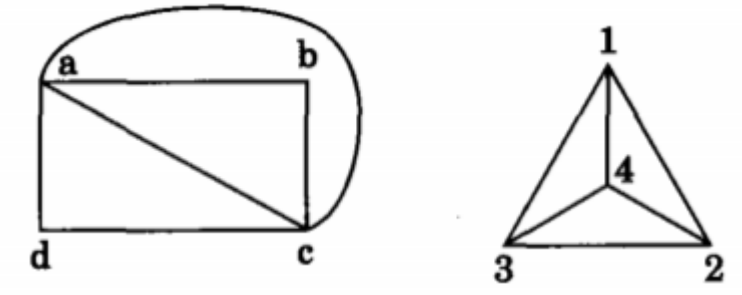
OR

Q.3 **(a)** The probability of a man hitting a target is 1/3. **07**

(i) If he fires 5 times, What is the probability of his hitting the targer at least twice?

(ii) How many times must he fire so that the probability of his hitting the target at least once is more than 90%?

(b) Define Vertex coloring and Region coloring. Determine whether the following graphs are isomorphic. If yes, justify your answer. **07**



Q.4 **(a)** From the following resuits, obtain the two regression equations and estimate the yield when the rainfall is 29 cm and the rainfall, when the yield is 600 kg: **07**

	Yield in kg	Rainfall in cm
Mean	508.4	26.7
Standard Deviation	36.8	4.6

The coefficient of correlation between yield and rainfall is 0.52.

(b) Describe each layers of OSI model in computer networks. **07**

OR

Q.4 **(a)** The following data represents rainfall(x) and yield of paddy per hectare (y) in a particular area. Find the linear regression of x on y. **07**

x	113	102	95	120	140	130	125
y	1.8	1.5	1.3	1.9	1.1	2.0	1.7

(b) Describe how mathematics is significant to machine learning. **07**

Q.5 **(a)** Explain Spiral model and Prototype model of software engineering and which model among these two is better? Justify your answer. **07**

(b) Discuss the use of probability distribution in computer vision. **07**

OR

Q.5 **(a)** Discuss the use of probability distribution in Bioinformatics. **07**

(b) What is Operating system? Explain any three types of operating system in details. **07**

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