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Question Paper Code: BCSB01

M.Tech I Semester End Examinations (Supplementary) - May, 2019

Regulation: .–R18

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Time: 3 Hours (CSE) **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Write a short note on markov chains and their applications. [7M]

   (b) The proportion of people who respond to a certain mail-order solicitation is a continuous random variable X that has the density function $f(x) = \begin{cases} \frac{2(x+2)}{5}, & 0 < x < 1 \\ 0 & elsewhere \end{cases}$ [7M]

   i.Show that P(0 < X < 1) = 1.

   ii. Find the probability that more than 1/4 but fewer than 1/2 of the people contacted will respond to this type of solicitation.

2. (a) State and prove central limit theorem. Write two applications of univariate and multivariate central limit theorem. [7M]

   (b) Define conditional expectation, suppose that we independently roll two standard six-sided dice. Let X_1 be the number that shows on the first die, X_2 the number on the second die, and X the sum of the numbers on the two dice. Then find E[X_1 | X = 2], E [X_2 | X = 5]. [7M]

UNIT – II

3. (a) Write a note on sampling distribution of a mean. Explain various methods of moments. [7M]

   (b) The probability distribution function $F(x) = \begin{cases} 0 & 0 < x < 1 \\ \frac{x-a}{b-a} & if\ a \le x \le b \\ 1 & if\ x \ge b \end{cases}$

   and its density function is $f(x) = \begin{cases} 0 & if\ a \le x \le b \\ \frac{1}{b-a} & if\ a \le x \le b \\ 0 & if\ x > b \end{cases}$

   Calculate the expectation and variance of X. [7M]

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4. (a) Define maximum likelihood estimator and explain. Write its advantages and disadvantages. [7M]

   (b) Suppose 10 rats are used in a biomedical study where the rats are injected with cancer cells and given a cancer drug that is designed to increase their survival rate. The survival times, in months, are 14,17,27,18,12,8,22,13,19 and 12. Assume that the exponential distribution applicable. Find maximum likelihood estimate of mean survival using exponential distribution

$$f(x,\beta) = \begin{cases} \frac{1}{\beta}e^{-x/\beta} & x > 0 \\ 0 & elsewhere \end{cases}$$ [7M]

UNIT – III

5. (a) Explain the method of least squares for regression. [7M]

   (b) The grades of a class of 9 students on a midterm report (X) and on the final examination (Y) are as follows:

   X: 77 50 71 72 81 94 96 99 67

   Y: 82 66 78 34 47 85 99 99 68

   (i) Estimate the linear regression line.

   (ii) Estimate the final examination grade of a student who received a grade of 85 on the midterm report. [7M]

6. (a) Find the least squares estimate for the parameter β in the linear equation $\mu_{y|x} = 3x$. [7M]

   (b) Estimate the regression line passing through the origin for the data given in Table 1: [7M]

Table 1

x	0.5	1.5	3.2	4.2	5.1	6.5
y	1.4	3.4	6.7	8.0	10.0	13.2

UNIT – IV

7. (a) Write a short note of graph coloring and state some applications. [7M]

   (b) Which pair are isomorphic in Figure 1? Why? [7M]

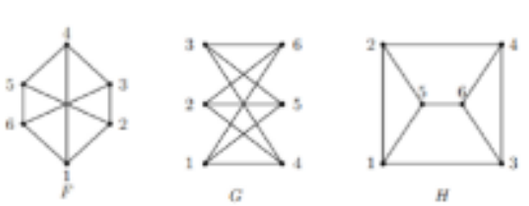


Figure 1

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8. (a) Let G be a connected graph with at least two vertices. Then, show that the following statements are equivalent. i. G is 2-colorable. ii. G is bipartite. iii. G does not have an odd cycle. [7M]

   (b) Determine the number of [7M]

   i. Words which uses 3 A's and 6 B's.

   ii. Arrangements of 3 A's and 6 B's.

   iii. Distinct strings that can be formed using 3 A's and 6 B's

   iv. Ways of placing 6 indistinguishable balls into 4 distinguishable boxes.

UNIT – V

9. (a) Compare and contrast seven layered architecture and TCP/IP architecture. [7M]

   (b) Explain various methods to analyse the web traffic [7M]

10. (a) What is market basket analysis and state the applications. [7M]

    (b) Write a note on secret key and public key encryption mechanism. [7M]

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