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Question Paper Code: BCSB01

M.Tech I Semester End Examinations (Regular) - January, 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) State the conditions for a function $f : S \to R$, Where S is a sample space and R is set of real numbers, to be probability mass or distribution function of a discrete random variable. Also state conditions for f to be probability density function of a continuous random variable [7M]
   (b) A shipment of 8 similar micro computers to a retail outlet contains 3 that are defective. If a school makes a random purchase of 2 of these computers, find the probability distribution for the number of defectives. [7M]
2. (a) State the Multi variate and Univariate Central limit theorems and their scope of application. [7M]
   (b) An Electrical firm manufactures light bulbs that have a length of life that is approximately normally distributed, with mean equal to 800 hours and a standard deviation of 40 hours. Find the probability that a random sample of 16 bulbs will have an average life of less than 775 hours. [7M]

UNIT – II

3. (a) Define and explain the concept of maximum likelihood estimation [7M]
   (b) State the formula for r^{th} moment and moment generating functions about the origin of the random variable X (discrete and continuous). What do the first, second and third moments convey. [7M]
4. (a) Analyze the sampling distribution of difference between two averages. [7M]
   (b) Define the concept of random sample. Give the mean, variance and standard deviation of a random sample. [7M]

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UNIT – III

5. (a) Write a note on over fitting of model assessment. [7M]

(b) A small experiment was conducted to fit a multiple regression equation relating the yield y to temperature x_1, reaction time x_2, and concentration of one of the reactants x_3. Two levels of each variable were chosen and measurements corresponding to the coded independent variables were recorded as follows in Table 1: [7M]

Table 1

y	x_1	x_2	x_3
7.6	-1	-1	-1
8.4	1	-1	-1
9.2	-1	1	-1
10.3	-1	-1	1
9.8	1	1	-1
11.1	1	-1	1
10.2	-1	1	1
12.6	1	1	1

Using the coded variables, estimate the multiple linear regression equation
$\mu_{y|x_1,x_2,x_3} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3$.

6. (a) Illustrate the steps of Principle component analysis using an example. [7M]

(b) Six different machines are being considered for use in manufacturing rubber seals. The machines are being compared with respect, to tensile strength of the product. A random sample of 4 seals from each machine is used to determine whether the mean tensile strength varies from machine to machine. The following Table 2 are the tensile-strength measurements in kilograms per square centimeter x 10^{-1}. Perform the analysis of variance at the 0.05 level of significance and indicate whether or not the mean tensile strengths differ significantly for the 6 machines. [7M]

Machine					
1	2	3	4	5	6
17.5	16.4	20.3	14.6	17.5	18.3
16.9	19.2	15.7	16.7	19.2	16.2
15.8	17.7	17.8	20.8	16.5	17.5
18.6	15.4	18.9	18.9	20.5	20.1

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UNIT – IV

7. (a) Find the number of circular arrangements of S = {A, A, B, B, C, C, D, D, E, E}. [7M]
   (b) What is a planar graph. prove that the complete graph K5 and the complete bipartite graph K3,3 are not planar. [7M]

8. (a) Find how many natural numbers n $\leq$ 1000 are not divisible by any of 2, 3 without repetitions. [7M]
   (b) Let G be a connected graph with exactly two vertices of odd degree. Then show that there is an Eulerian walk starting at one of those vertices and ending at the other. [7M]

UNIT – V

9. (a) What is SDLC and explain any two models of software development. [7M]
   (b) What are various security threats and mechanism in Cyber space. [7M]

10. (a) Write a note on supervised and unsupervised learning. [7M]
    (b) What is the difference between clustering and classification with examples. Name two algorithms for each. [7M]

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