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**Presidency University**

**Bengaluru**

**SCHOOL OF ENGINEERING / COMPUTER SCIENCE ENGINEERING**

**Summer Term End Term Examinations, August 2024**

**Date**: 05-08-2024

**Time**: 09:30 am – 12:30 pm

**Max Marks**: 100

**Weightage**: 50%

**Summer Term**: B.Tech

**Course Code**: MAT2002

**Course Name**: Numerical methods, probability distributions and

sampling techniques

**Department:** Mathematics

**Instructions:**

1. *Read the all questions carefully and answer accordingly.*
2. *Do not write any matter on the question paper other than roll number.*

**PART A**

**Answer any SIX Questions. Each question carries 10 marks. (6Q x 10M = 60M)**

1. Solve the system of equations ,  and  using

Gauss-Seidel method with the initial approximation (0, 0, 0) (correct up to 3 decimal places).

(CO1) [Comprehension]

1. Find a real root of the equation  using Newton-Raphson method with the initial approximation . (CO1) [Comprehension]

1. Find the value of f(6), using Lagrange’s interpolation formula, from the data

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| x | 2 | 5 | 7 | 10 | 12 |
| f(x) | 18 | 180 | 448 | 1210 | 2028 |

(CO2) [Comprehension]

1. Using divided difference interpolation method, find the value of f(5) from the data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| x | 1 | 3 | 4 | 6 |
| f(x) | 4 | 120 | 340 | 2544 |

(CO2) [Comprehension]

1. Two dice are thrown simultaneously. Find the probability of getting (a) the same number on both dice (b) an even number as the sum (c) a multiple of ‘3’ as the sum (d) a total of 8 (e) a total of at least 10. (CO3) [Comprehension]
2. The probability that a married man watches a certain television show is 0.4 and the probability that a married woman watches the show is 0.5. The probability that a man watches the show, given that his wife does, is 0.7. Find the probability that (a) a married couple watches the show (b) wife watches the show, given that her husband does (c) at least one member of a married couple will watch the show. (CO3) [Comprehension]
3. A university bought 45%, 25% and 30% of computers from HCL, Wipro and IBM respectively. Suppose that 2% of the computers from HCL, 3% of the computers from Wipro and 1% of the computers from IBM are found to be defective. Given that a randomly chosen computer is defective, what is the probability that it is made by (a) HCL (b) Wipro ? Apply the Bayes rule to find the required conditional probability. (CO3) [Comprehension]
4. The average monthly sales of ‘Reliable Computers’ are 2500 units with a standard deviation of 100 units. The sales are found to be normally distributed over months. What are the chances that the sales during a particular month will be (a) at most 2400 units (b) at least 2400 units (c) between 2450 to 2550 units (given that 𝑃(𝑍 ≤ –1) = 0.1587, 𝑃(𝑍 ≤ 0.5) = 0.6915 and 𝑃(𝑍 ≤ – 0.5) = 0.3085). (CO4) [Comprehension]

**PART B**

**Answer any TWO Questions. Each question carries 20 marks. (2Q x 20M = 40M)**

9. Evaluate the definite integral  numerically using (i) trapezoidal rule (ii) Simpson’s one-third rule (iii) Simpson’s three-eighth rule with h = 1. (CO2) [Comprehension]

10. Find y(0.1) by applying the fourth order Runge-Kutta method given that  and . (CO2) [Comprehension]

11. (a) It has been observed that 2 out of 10 bulbs manufactured by a company are defective. (i) Use the Binomial distribution to construct a suitable mathematical model with the random variable representing the number of defective bulbs manufactured by the company out of a total of 𝑛 bulbs. (ii) If a box of 10 bulbs is selected, what is the probability that at most 3 are defective? (iii) If a box containing 10 bulbs is selected, what is the probability that more than 7 are defective? (CO4) [Application]

(b) It has been observed that 10 drops of water trickle every 5 minutes from a leaking pipe. What is the probability that, in 5 minutes, (i) exactly 6 drops of water trickle (ii) at most 2 drops of water trickle (iii) at least 2 drops of water trickle? (CO4) [Application]