B.Tech (Honours) (Data Science/Artificial Intelligence)

3rd Semester,Class Test - I, December, 2022

(AICTE Scheme)

(Computer Science and Engineering Branch)

Computer Organization and Architecture

(B000373(022))

Time Allowed:2 hours

Maximum Marks:40
Minimum Pass Marks:14

Roll No-300012821042

Note: (iii)Each question contains four parts. Part (a) of each question is compulsory.
Attempt any two parts from (b), (c), and (d) of each question.
(iv) The figure in the right-hand margin indicates marks.

I.   (a) Explain Control Unit organization and difference between Hardwired Control Unit   [4]
and Micro-Programmed Control Unit.

(b) Explain all the different ways in which location of operand is specified in an   [8]
instruction called as addressing modes.

(c) Explain Look-ahead carry generator.   [8]

(d) Write a program to evaluate the arithmetic statement: [8]
X = A+B/C*(D+E)-F
a. Using a memory type computer with three address instructions.
b. Using a general register computer with two address instructions.
c. Using an accumulator type computer with one address instructions.

II.   (a)Describe all the methods of obtaining 2's Complement of a given number: Express -   [4]
39 in 8-bit 2's complement form.

(b)Design the flowchart for signed binary multiplication or Booth algorithm using 2's   [8]
complement numbers:
a. (-9) x (-13).

(c)Draw neat flowchart for restoring division method with the evaluation-   [8]
Dividend= 1010
Divisor= 0011
Find remainder and quotient?

(d)Draw neat flowchart for non- restoring division method with the evaluation-   [8]
    •   Dividend= 1011
    •   Divisor= 0101
Find remainder and quotient?

B.Tech (Honours)(Data Science/Artificial Intelligence)
3rd Semester, Class Test - I, December, 2022
(AICTE Scheme)
(Computer Science and Engineering Branch)
Database Management System
(B000375 (022))

Time Allowed: 2 hours

Maximum Marks: 40
Minimum Pass Marks: 14

ROll No - 30001287j042

Note: *(vii)*   Each question contains four parts. Part (a) of each question is compulsory. Attempt any two parts from (b), (c), and (d) of each question.

         (viii)   The figure in the right-hand margin indicates marks.

I.(a)	What is key? Write about various keys in brief.	[4]
(b)	Compare file oriented approach and database system approach. Write the advantages and disadvantages of database system approach.	[8]
(c)	Discuss database system structure with neat diagram & their various components.	[8]
(d)	Explain E-R diagram. Make an E-R diagram of library management system	[8]
II.(a)	Write the roles and responsibilities of DBA.	[4]
(b)	What is meant by relational calculus? Describe with their types and example.	[8]
(c)	Explain relational algebra with their various operations.	[8]
(d)	Explain various join operations with an example.	[8]

Probability and Statistics

(B000371(022))

Time Allowed: 2 hours

*Maximum Marks:*40

Minimum Pass Marks: 14

ROll No — 300012821042

Note:
(i) Each question contains four parts. Part (a) of each question is compulsory. Attempt any two parts from (b), (c), and (d) of each question.
(ii) The figure in the right-hand margin indicates marks.

I. (a) What do you mean by Probability. Write two properties of probability of events from a sample space. Check whether the following can serve as probability distribution: [4]

   a. $f(x) = \frac{x-2}{2}$ for $x=1,2,3,4$

   b. $g(x) = \frac{x^2}{25}$ for $x=0,1,2,3,4$

(b) Define Random Variable, its domain and codomain with an example. Write its two types. Two cards are drawn successively with replacement from a well-shuffled deck of 52 cards. Find the probability distribution of the number of Kings. [8]

(c) What is Mean and Variance of a random variable. Let a pair of dice be thrown and the random variable X be the sum of the numbers that appear on the two dice. Find the mean and variance of X. [8]

(d) What is Bayes Theorem. Given three identical boxes I, II and III, each containing two coins. In box I, both coins are gold coins, in box II, both are silver coins and in the box III, there is one gold and one silver coin. A person chooses a box at random and takes out a coin. If the coin is of gold, what is the probability that the coin was chosen from bag I? [8]

II. (a) What is Binomial Distribution. What is the probability density function of getting 'r' success in random experiment of 'n' trials. What is its mean and variance. [4]

(b) If a fair coin is tossed 10 times, find the probability of getting: [8]
(a) exactly six heads.
(b) at least six heads.
(c) at most six heads.
(d) zero heads.

(c) What is Geometric Distribution. Write its probability density function, mean and standard deviation. Find the probability that in successive tosses of a fair die, a 3 will come up for the first time on the fifth toss. [8]

(d) Explain Exponential Distribution with an example. Write its mean and variance. Suppose the life of a mobile battery is exponentially distributed with parameter 'lambda' = 0.001 day. What is the probability that a battery will last more than 1200 days. [8]

B.Tech (Honours)(Data Science/Artificial Intelligence)

3rd Semester, Class Test - I, December, 2022

(AICTE Scheme)

(Computer Science and Engineering Branch)

Analysis and Design of Algorithm

(B000372(022))

Time Allowed: 2 hours

Maximum Marks: 40

Minimum Pass Marks: 14

Roll No - 30001282104

Note:
(i) Each question contains four parts. Part (a) of each question is compulsory. Attempt any two parts from (b), (c), and (d) of each question.
(ii) The figure in the right-hand margin indicates marks.

(a) Define Algorithm, Time Complexity and Space Complexity. Arrange following rate of growth in increasing order. [4]

$$2^n, n \log n, n^2, 1, n, \log n, n!, n^3$$

(b) Explain why analysis of algorithms is important with example? Explain: WorstCase, Best Case & Average Case Complexity with example. [8]

(c) Explain various properties of an algorithm with example supporting the importance of those properties. [8]

(d) Explain divide and conquer and dynamic programming with the help of example. Differentiate between divide and conquer and dynamic programming. [8]

(a) Why is sorting techniques studied in details? Explain the importance with the help of an example. [4]

(b) Explain counting sort with the help of an example and code. Also, how is counting sort different from other sorting techniques like bubble sort or inserting sort or others. [8]

(c) Explain radix sort with the help of an example and code. Also explain the complexity of radix sort. [8]

(d) Discuss the time and space complexity analysis of Fibonacci sequence with the help of an example. Can this be improved by using dynamic programming? Explain the answer. [8]

B.Tech (Honours)(Data Science/Artificial Intelligence)

3ʳᵈ Semester, Class Test - 1, December, 2022

(AICTE Scheme)

(Computer Science and Engineering Branch)

Discrete Structure

(B000374(022))

Time Allowed: 2 hours

Maximum Marks: 40
Minimum Pass Marks: 14

Roll No -30001282↓0↲2

Note: (i)   Each question contains four parts. Part (a) of each question is compulsory. Attempt any two parts from (b), (c), and (d) of each question.
       (ii) The figure in the right-hand margin indicates marks.

I.   (a) Define Inclusion–Exclusion Principle. Write application of Inclusion–Exclusion Principle.   [4]

(b) Explain Define power sets of a set and find the power set of $S = \{1, 2, 3\}$.   [8]
Principle of Mathematical Induction and by using mathematical inductionmethod provethat :
$$1 + 3 + 5 + \cdots + (2n - 1) = n^2$$
(c) Construct the truth table of the compound proposition $(p \vee \neg q) \rightarrow (p \wedge q)$. Find the   [8]
output for logic circuit.Construct the truth table of logic circuit.
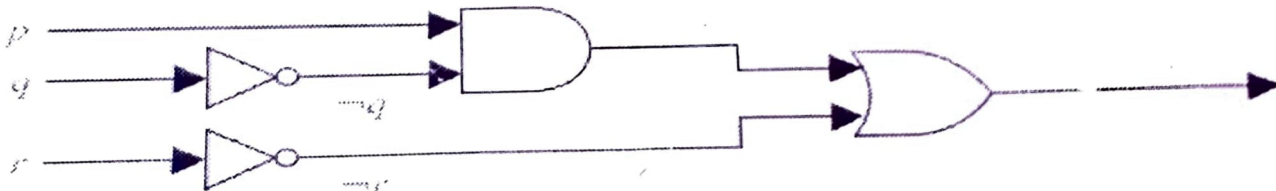
(d) Define Basic Logic Gate and explain NOR Gate and NAND Gate. Construct the   [8]
truth table of all logic gate.Explain equivalence relation with example.

II   (a) State and prove De Morgan's Laws by using truth table.   [4]
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(b) Explain Quantifiers with example. What are the negations of the statements   [8]
$\forall x(x^2 > x)$ and $\exists x(x^2 = 2)$?Show that $\neg \forall x(P(x) \rightarrow Q(x))$ and $\exists x(P(x) \wedge \neg Q(x))$ are logically equivalent.
(c) Define Logical Equivalences. Show that$(p \rightarrow q) \wedge (p \rightarrow r)$ and $p \rightarrow (q \wedge r)$ are   [8]
logically equivalent.

(d) Find an explicit formula for the Fibonacci numbers. What is the solution of the   [8]
recurrence relation $a_n = 6a_{n-1} - 9a_{n-2}$ with initial conditions $a_0 = 1$ and $a_1 = 6$?