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

RollNo - 300012871042

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   [8]
      advantages and disadvantages of database system approach.
 (c) Discuss database system structure with neat diagram & their various   [8]
      components.
 (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]

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 and Micro-Programmed Control Unit.   [4]

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

(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 - 39 in 8-bit 2's complement form.   [4]

(b) Design the flowchart for signed binary multiplication or Booth algorithm using 2's complement numbers: [8]
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)

Probability and Statistics

(B000371(022))

Time Allowed: 2 hours

Maximum Marks:40

Minimum Pass Marks:14

ROll No - 3000128 21042

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   [4]
from a sample space. Check whether the following can serve as probability
distribution:

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   [8]
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.

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

(d)   What is Bayes Theorem. Given three identical boxes I, II and III, each containing   [8]
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?

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

(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   [8]
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.

(d)   Explain Exponential Distribution with an example. Write its mean and variance.   [8]
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.

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

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

(AICTE Scheme)

(Computer Science and Engineering Branch)

Analysis and Design of Algorithm

(B000372(022))

Maximum Marks:40

Time Allowed:2 hours

Minimum Pass Marks:14

Roll No-3000128821042

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

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

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

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

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

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

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

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

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

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

3rd Semester, Class Test - I, 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 -3000128210 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   [4]
Principle.

(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 $(p \lor \neg q) \to (p \land q)$. Find the   [8]
output for logic circuit.Construct the truth table of logic circuit.
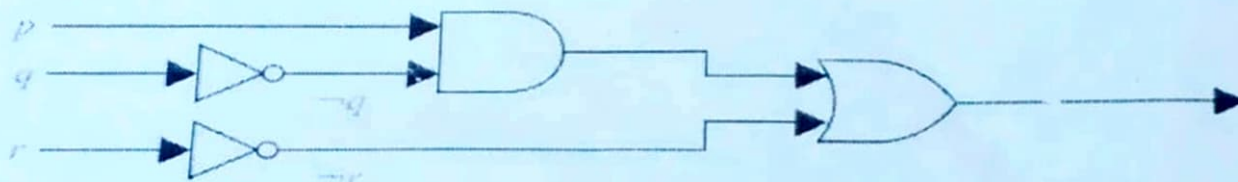
(d) Define Basic Logic Gate and explain NOR Gate and NAND Gate. Construct the   [8]
truth table of all logic gate.Explain equivalence relation with example.

II   (a) State and prove De Morgan's Laws by using truth table.   [4]

(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 $\neg \forall x(P(x) \to Q(x))$ and $\exists x(P(x) \land \neg Q(x))$ are
logically equivalent.

(c) Define Logical Equivalences. Show that$(p \to q) \land (p \to r)$ and $p \to (q \land r)$ 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 $a_1 = 6$?

Time Allowed 2 hours

Maximum Marks: 40
Minimum Pass Marks: 14

Roll No—300012801042

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

I   (a)   Define Stored Procedure, Dynamic and Static SQL.   [3]
    (b)   Employee Table: [10]

EmpID	EmpFname	EmpLname	Department	Project	Address	DOB	Gender
1	Sanjay	Mehra	HR	P1	Hyderabad(HYD)	01/12/1976	M
2	Rohan	Diwan	Admin	P2	Delhi(DEL)	01/1/1968	M
3	Sonia	Kulkarni	Account	P3	Mumbai(BOM)	02/5/1980	F
4	Ankit	Kapoor	HR	P1	Hyderabad(HYD)	02/5/1992	M
5	Ananya	Mishra	Admin	P2	Delhi(DEL)	03/7/1994	F

Employee_Position Table:

EmpID	EmpPosition	DOB	Salary
1	Manager	01/05/2022	500000
2	Executive	02/05/2022	75000
3	Manager	01/05/2022	90000
2	Lead	02/05/2022	85000
1	Executive	01/05/2022	300000

Write a SQL for the following questions:

(i) Find number of employees whose DOB is between 02/05/1970 to 31/12/1975 and are grouped according to gender.

(ii)   Fetch details of employees whose EmpLname ends with an alphabet `A` and contains five alphabets.

(iii)   Fetch all employees who also hold the managerial position.

(iv)   Write a query to retrieve the list of employees working in the same department.

(v)   Write a query to retrieve the EmpFname and EmpLname in a single column as "FullName". The first name and the last name must be separated with space.

(c)   (i) Why we use view in DBMS? Write about their creation, updation and deletion with brief details and examples.
[10]

(ii) Write about Group by, having and order by clauses with an example.

II.   (a)   Define RAID in DBMS.
[3]

(b)   Explain functional dependency, trivial functional dependency and decomposition in DBMS. Consider a relational schema R(A, B, C, D, E, H) on which the following FDs holds – {A->B, BC->D, E->C, D->A } What are the candidate keys of R?
[10]

(c)   Define normalization with their various types. Insert the keys 79, 69, 98, 72, 14, 50 into the **Hash Table of size 13**. Resolve all collisions using Double Hashing where first hash-function is $h1(k) = k \bmod 13$ and second hash-function is $h2(k) = 1 + (k \bmod 11)$
[10]

III.   (a)   Define Shadow paging with an example.
[4]

(b)   Consider the 2 transactions T1 and T2 and four schedules S1, S2, S3 and S4 of T1 and T2 are given below:

T1: R1[X] W1[X] W1[Y]

T2: R2[X] R2[Y] W2[Y]

S1: R1[X] R2[X] R2[Y] W1[X] W1[Y] W2[Y]

S2: R1[X] R2[X] R2[Y] W1[X] W2[Y] W1[Y]

S3: R1[X] W1[X] R2[X] W1[Y] R2[Y] W2[Y]

S4: R2[X] R2[Y] R1[X] W1[X] W1[Y] W2[Y]

Which schedules is/are conflict serializable?
[10]

(c)   Write about various concurrency control protocols in brief details.
[10]

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) Explain Joint, Marginal, and Conditional Probability.   [4]

(b) Suppose A and B are two independent events for which
$P(A) = 0.20$ and $P(B) = 0.60$.
• Find $P(A/B)$. • Find $P(B/A)$. • Find $P(A$ and $B)$. • Find $P(A$ or $B)$.   [8]

(c) This imaginary data represents the Attendance and CT-1 Marks for the Students of CSVTU, Bhilai for 9 students. Predict the marks for 10th student using regression method.

Attendance	CT-1 Marks for PS
29.97	10
59.42	35
28.12	11
67.11	37
76.66	39
43.77	23
	11
53	14
75.07	35
52.35	?

[8]

(d) Given Below are packages that was obtained by Students in LPA of three branches AI, CSE & DS respectively from normal populations with equal variances. Test the hypothesis at 5% level (Ftab=3.88) that population mean is equal.

AI	CSE	DS
8	7	12
10	5	9
7	10	13
14	9	12
11	9	14

[8]

II. (a) What is Hypothesis Testing? Explain in Brief. [4]

(b) Can it be concluded that average life span of an Indian is more than 70 years If a random sample of 100 Indians has an average life span of 71.8 years with standard deviation of 7.8 years. $(z(\alpha)/z(tab)=1.64)$. [8]

(c) In a survey of 200 boys of which 75 were intelligent, 40 had educated father while 85 of the unintelligent boys had uneducated fathers. Do these figures Support the Hypothesis that educated fathers have intelligent boys? *Chi square* [8]

tabulated value key point - 8.4841

(d) A farmer applies three types of fertilizers on 4 separate plots. The figures on yield per acre are tabulated as following-

Test for two Null Hypothesis Test Cases-
a) Plots do not differ Materially.
b) Fertilizers do not differ Materially.
   (Column(tab)=4.76, Row(tab)=5.14)

Fertilizers	A	B	C	D
Nitrogen	6	4	8	6
Potash	7	6	6	9
Phosphate	8	5	10	9

[8]

[8]

Time Allowed: 2 hours

Maximum Marks: 40
Minimum Pass Marks: 14

Roll No- 30001082+042

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) Explain complete graphs and Bipartite Graphs with examples?   [4]
(b) Explain Kruskal's algorithm and find minimal spanning tree by using   [8]
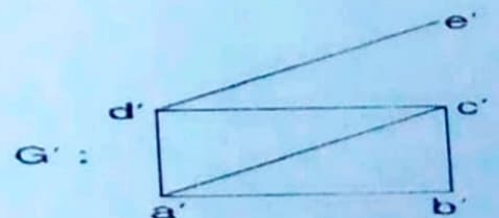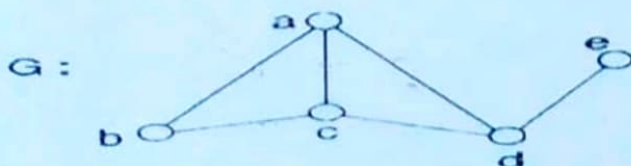Kruskal's algorithm?

(a)
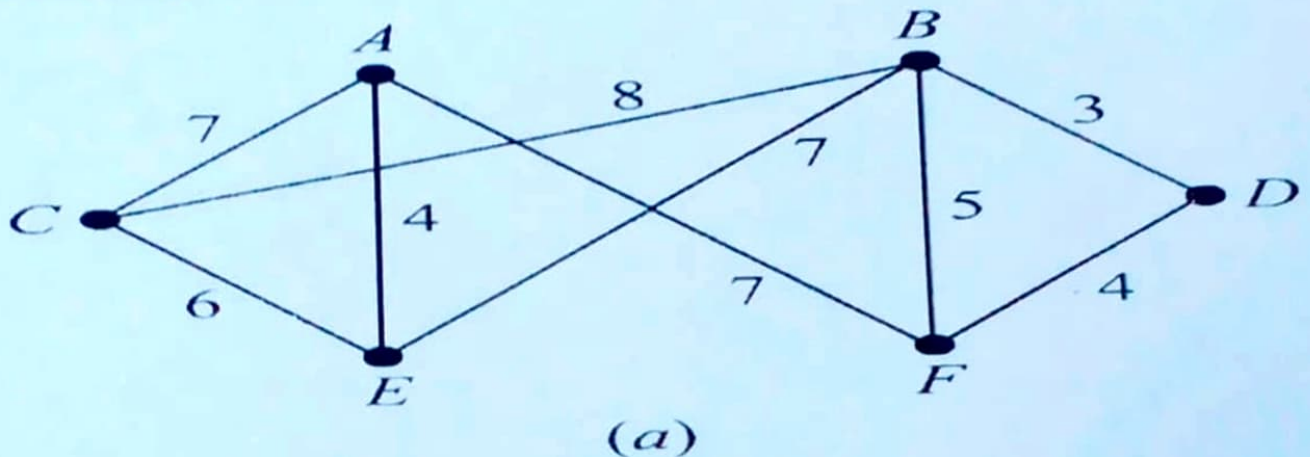
(c) Prove that :   [8]
(i) If a connected planar graph G has n vertices, e edges and r region, then $n - e + r = 2$.
[4 marks]
(ii) Show that the graph K_5 is not planar graph.   [2 marks]
(iii) Show that the graph $K_{3,3}$ is not planar graph.   [2 marks]
(d) Show that the following graphs are isomorphic: [8]

(a) (i) Write Chinese Remainder theorem. [1]

(ii) Find the remainder when 2^{100} divided by 7. [1]

(iii) Find the remainder obtained by dividing $1! + 2! + 3! + \cdots + 1000!$ by 20. [1]

(iv) Prove that the number 1571427 is divisible by 11. [1]

(b) *Explain Euler's $\emptyset$ − function , Tau − function , Sigma function* [8]

with properties?

(c) Prove that $(P(\mathbb{N}),*)$, $X * Y = X \Delta Y = (X − Y) \cup (Y − X)$ is a group under [8] symmetric difference?

(d) [8]

(i) Write an example of non-abelian group in which every proper subgroup is normal and explain it?

(ii) Write an example of abelian group in which every proper subgroup is normal and explain it?

Chhattisgarh Swami Vivekanand Technical University

University Teaching Department

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

Class Test - II, FEB, 2023

Subject: Analysis & Design of Algorithm   B000372 (022)

Time Allowed: 2 hours   Maximum Marks: 40

                                                   Minimum Pass Marks: 14

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 Characteristics, Components and Applications of Greedy Methods.   [2]

      (b)   Define Fractional Knapsack Problem. Let us consider that the capacity of the knapsack $W = 60$ and the list of provided items are shown in the following table & find the best approach (From all 3 ways).

Item	A	B	C	D
Profit	280	100	120	120
Weight	40	10	20	24
Ratio ($p_i w_i$)	7	10	6	5

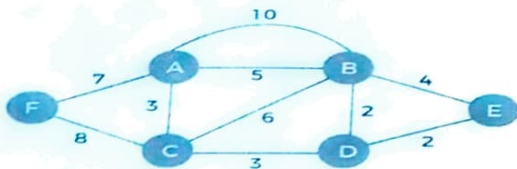   [6]

      (c)   Define Bellman Ford Algorithm & find the shortest distance from the single vertex (A) to all the other vertices of a weighted graph

5-Way Search Tree

Insert 4, 5, 58, 6 in the order

[5]

(c) Explain NP-Completeness [5]

(d) Difference between Approximation Algorithm and Randomized Algorithms
[5]

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[6]

(d) Define Kruskal Algorithm & find the minimum cost of a spanning tree
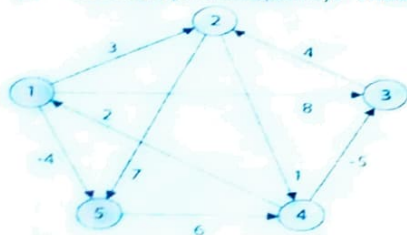

[6]

II (a) Define the approach of Dynamic Programming [2]

(b) Explain LCS & Find the longest common subsequence's to both string
X 10010101   Y 010110110
[6]

(c) Explain MCM & find minimum cost of given sequence
{4, 10, 3, 12, 20, and 7} [6]

(d) Evaluate All-pair shortest path Floyd's Warshall algorithm

[6]

III (a) Define String Matching [2]

(b) Explain B Tree & insert and then Delete (7) the items in given Tree

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

Class Test - II, January, 2023

(AICTE Scheme)

(Computer Science and Engineering Branch)

Subject- Computer Organization and Architecture

(B000373(022))

Time Allowed 1 hour 30 minutes

Maximum Marks: 40

Minimum Pass Marks: 14

Roll No – 3000128210 4 2

Note:
(i) Each question contains four parts. Part (1) of each question is compulsory. Attempt any two parts from (2), (3), and (4) of each question.
(ii) The figure in the right-hand margin indicates marks.

I.		
	(1) Difference between DRAM and SRAM explain with block diagram.	[4]
	(2) What do you mean by virtual memory explain with block diagram? Discuss how paging and segmentation helps in implementing virtual memory.	[4+4]
	(3) Consider a 4-way set associative cache consisting of 128 lines with a line size of 64 words. The CPU generates a 20-bit address of a word in main memory. (a) How many bits are there in the TAG, SET and WORD fields of the address format? (b) What is meant by locality of reference in cache memory?	[6+2]
	(4) A digital computer has a memory unit of 64K × 16 and a cache memory of 1K words. The cache uses direct mapping with a block size of four words. (a)How many bits are there in the TAG, LINE and WORD fields of the address format? (b)How many blocks can the cache accommodate?	[6+2]
II.		
	(1)Write short notes on: (a) Four major difference between RISC and CISC. (a) List the types of data hazards and list the techniques used for overcoming hazard.	[2+2]
	(2) What is pipelining explain with flowchart? Consider two pipelines A and B, where pipeline A is having 8 stages of uniform delay of 3ns. Pipeline B is having 5 stages with respective stage delays of 2ns, 3ns, 5ns, 6ns, and 1ns. How much time is saved using the pipeline A instead of pipeline B when 100 tasks are pipelined.	[4+4]
	(3)Write short notes on: (a) Four major difference between closely coupled and loosely coupled multiprocessor systems. (b) What is bus arbitration? Describe all the methods to implement the bus architecture.	[4+4]
	(4) Interrupt structure of 8086 explain with block diagram.	[8]