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322411(14)

B. E. (Fourth Semester) Examination, April-May 2021

(Old Scheme)

(CSE, IT Branch)

COMPUTATIONAL MATHEMATICS

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

*Note : Part (a) of each question is compulsory and carrying 2 marks. Solve any other **two** parts from each unit carrying 7 marks.*

Unit-I

1. (a) The order of convergence in Newton-Raphson method is :

(i) 2

(ii) 3

(iii) 0

(iv) None.

(b) Find a positive real root of $x \log_{10} x = 1 \cdot 2$ using the bisection method. 7

(c) Find a real root of the equation $x^2 - 2x - 5 = 0$ by the method of false position correct to three decimal places. 7

(d) Find by Newton's method, the real root of the equation $3x = \cos x + 1$ correct to four decimal places. 7

Unit-II

2. (a) By Gauss eliminition method, solve $x + y = 2$ and $2x + 3y = 5$. 2

(b) Apply Gauss-Jordan method to solve the equations :

$$x + y + z = 9$$
$$2x - 3y + 4z = 13$$
$$3x + 4y + 5z = 40$$
7

(c) Apply Gauss-Seidal iteration method to solve the equations :

$$20x + y - 2z = 17$$
$$3x + 20y - z = -18$$
$$2x - 3y + 20z = 25$$
7

(d) Solve the equation :

$$10x - 2y - 3z = 205$$
$$-2x + 10y - 2z = 154$$
$$-2x - y + 10z = 120$$

by Relaxation method. 7

Unit-III

3. (a) Newton's backward interpolation formula is 2

(b) From the following table, estimate the number of students who obtained marks between 40 and 45 : 7

Marks :	30-40	40-50	50-60	60-70	70-80
No. of Students :	31	42	51	35	31

(c) Apply Bessel's formula to obtain y_{25}, given

$$y_{20} = 2854, \ y_{24} = 3162, \ y_{28} = 3544, \ y_{32} = 3992 \quad 7$$

(d) Given the values

x :	5	7	11	13	17
$f(x)$:	150	392	1452	2366	5202

evaluate $f(9)$, using Newton's divided difference formula. 7

Unit-IV

4. (a) Simpson's $\frac{3}{8}$ th rule states that 2

(b) The following data gives the velocity of a particle far 20 seconds at an interval of 5 seconds. Find the initial acceleration using the entire data : 7

Time t (sec) :	0	5	10	15	20
Velocity v (m/sec) :	0	3	14	69	228

(c) Evaluate the integral $\int_0^1 \frac{x^2}{1+x^3} dx$ using Simpson's 1/3 rd rule. Compare the error with the exact value $\log 2^{1/3}$. 7

(d) Use the Trapezoidal rule to estimate the integral $\int_0^2 e^{x^2} dx$ taking the number 10 intervals. 7

Unit-V

5. (a) Runge-Kutta method is a self-starting method. 2

(True or False)

(b) Find by Taylor's series method, the values of y at $x = 0·1$ and $x = 0·2$ to five places of decimals from $dy/dx = x^2 y - 1$, $y(0) = 1$. 7

(c) Apply Runge-Kutta fourth order method to find an approximate value of y when $x = 0·2$ given that $\frac{dy}{dx} = x + y$ and $y = 1$ when $x = 0$. 7

(d) Given

$$\frac{dy}{dx} = x^2 (1+y) \text{ and } y(1) = 1, \ y(1·1) = 1·233,$$

$$y(1·2) = 1·548, \ y(1·3) = 1·979,$$

evaluate $y(1·4)$ by Adams-Bashforth method. 7

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B. E. (Fourth Semester) Examination, April-May 2021

(Old Scheme)

(CSE, IT Engg. Branch)

DISCRETE STRUCTURE

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Attempt all questions. Part (a) is compulsory. Solve any two parts from (b), (c) and (d). Each carry 7 marks.*

Unit-I

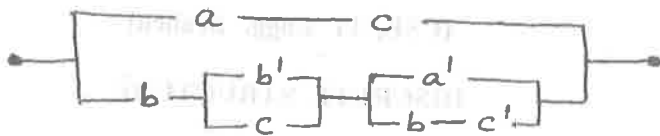1. (a) Is the statement $(\sim p) \vee q$ is a tautology?   2

[2]

(b) State and prove Idempotent law.   7

(c) Convert the Boolean function   7

$$f(x,y,z) = (x'+y+z').(x'+y+z)(x+y'+z)$$

in disjunctive normal form.

(d) Replace the following switching circuit by a simpler one: 7

Unit-II

2. (a) Write the set $A = \{x : x^2 - 3x + 2 = 0\}$ in tabular form.   2

(b) If A, B, C are any three non - empty sets, then prove that $(A-B) \times C = (A \times C) - (B \times C)$ 7

(c) Answer these questions for the poset   7

$(\{\{1\},\{2\},\{4\}\{1,2\},\{1,4\},\{2,4\},\{3,4\},\{1,3,4\},$

[3]

$\{2,3,4\}\} \subseteq)$

(i) Find the maximal elements.

(ii) Find the minimal elements.

(iii) Is there a greatest element?

(iv) is there a least element?

(v) Find all upper bounds of $\{\{2\},\{4\}\}$

(vi) Find the least upper bound of $\{\{2\},\{4\}\}$, if it exists.

(vii) Find all lower bounds of $\{\{1,3,4\},\{2,3,4\}\}$

(viii) Find the greatest lower bound of $\{\{1,3,4\},$ $\{2,3,4\}\}$, if they exists.

(d) Show that the mapping $f : R \to R$ be defined by

$$f(x) = ax + b, \quad \text{where} \quad a, b, x \in R, a \neq 0 \quad \text{is}$$

invertible. Define its inverse.   7

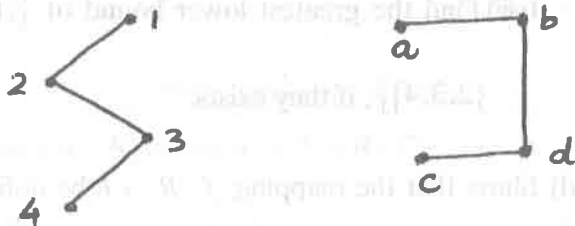## Unit-III

3. (a) Define order of an element. 2

   (b) Show that the set $\{1, 2, 3, 4, 5\}$ is not a group under addition and multiplication module 6. 7

   (c) State and prove Lagrange's theorem. 7

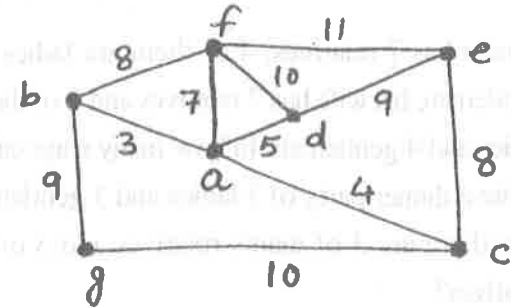   (d) Prove that, every field is an integral domain. 7

Unit-IV

4. (a) Does there exists a 4 - regular graph on 6 vertices if so construct a graph. 2

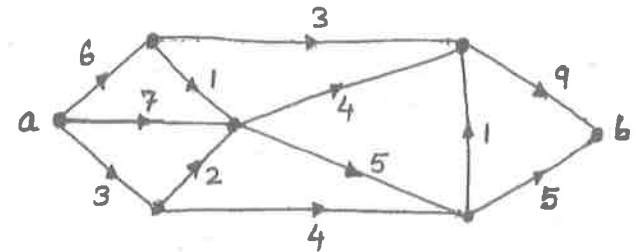   (b) Define isomorphic graph. Show that the two graphs shown in figure are isomorphic. 7

   (c) Find the minimum spanning tree for the graph in figure by Kruskal's algorithm : 7

   (d) Find the maximum flows between a and b in the diagram below where arrow represents direction of flow : 7

Unit-V

5. (a) Write principle of mathematical induction. 2

   (b) Write generalized Pigeonhole principle. Find the minimum number of students in a class to be sure

that four out of them are born in the same month.   7

(c) A man has 7 relatives, 4 of them are ladies and 3 gentleman, his wife has 7 relatives and 3 of them are ladies and 4 gentleman. In how many ways can they invite a dinner party of 3 ladies and 3 gentleman so that there are 3 of man's relatives and 3 of wifes relatives?   7

(d) Solve $a_n = a_{n-1} + 2a_{n-2}, n \geq 2$ with the initial conditions $a_0 = 0, a_1 = 1$ 7

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322413(22)

B. E. (Fourth Semester) Examination, April-May 2021

(Old Scheme)

(CSE, IT Engg. Branch)

DATA STRUCTURES

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : All questions are compulsory, attempt any two among (b, c & d) carrying 7 marks, Part (a) is compulsory carrying 2 marks.

Unit-I

1. (a) Define Data structure with operations.   2

    (b) Define searching and describe an algorithm of

Binary search. 7

(c) Define sorting and describe an algorithm of insertion sort with suitable example. 7

(d) Describe an algorithm of sparse matrices. 7

Unit-II

2. (a) Define Header linked list. 2

(b) Describe an algorithm to find the location and insert new items into linked list. 7

(c) Describe an algorithm to delete items from circular linked list 7

(d) Define two ways link lists and describe an algorithm to delete the node from given linked list. 7

Unit-III

3. (a) Define D-Queues. 2

(b) Define recursion and briefly Explain Tower of Hanoi. 7

(c) Explain Polish notation with all types and transform given infix expression into prefix and postfix. 7

(i) $A * B + C / D$

(ii) $\left(\left(A*(B+C)\right)/D\right)$

(iii) $X = \left(\left((A*B)-(C/D)^{\wedge}E\right)\right)$

(d) Describe an algorithm to transforming infix expression into postfix expression. Convert $A*(B+C)*D$ to postfix notation using stack. 7
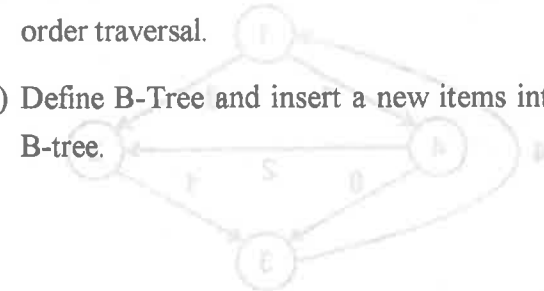
Unit-IV

4. (a) Define complete binary trees. 2

(b) Define AVL trees. Briefly explain all deletion types of AVL trees. 7

(c) Define Tree Traversal and write an algorithm of in order traversal. 7

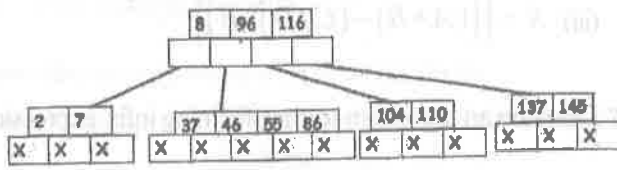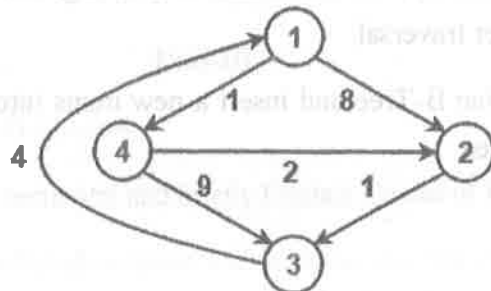(d) Define B-Tree and insert a new items into given B-tree. 7

5-Way Search Tree

Insert 4, 5, 58, 6 in the order

Unit-V

5. (a) Define Graph.   2

(b) Define Floyd Warshall Algorithm with advantages. consider the following directed weighted graph.   7

Using Floyd Warshall Algorithm, Find the shortest path distance between every pair of vertices.

(c) Explain and write an algorithm of depth first search.   7

Consider the graph G along with its adjacency list, given in the figure below. Calculate the order to print all the nodes of the graph starting from node H, by using depth first search (DFS) algotithm.

Adjacency Lists

A : B, D
B : C, F
C : E, G, H
G : E, H
E : B, F
F : A
D : F
H : A

(d) Briefly explain Topological sorting.   7

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BE (4th Semester)
Examination, April - May, 2021

Branch : CSE

COMPUTER SYSTEMS ARCHITECTURE

Time Allowed : Three Hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : All questions are compulsory. Part (a) of all

questions is compulsory and carries 2 marks.

Attempt any two parts from remaining (b), (c) &

(d) carries 7 marks.

Q. 1. (a) How is a number expressed in general

number system ?

2

(b) When a floating-point number is said to be

unnormalized ? How floating-point numbers

can be normalized ?

7

(c) What are addressing modes ? Explain

various addressing modes with suitable

example.

7

(d) Use 2's complement to determine the

values of :

7

(i) $(41)_5 - (32)_5$

(ii) $(-70)_{10} + (43)_{10}$

Q. 2. (a) What is the advantage of using Booth's Algorithm ?   2

(b) Distinguish between integer & floating point representation of numbers with their relative advantages & disadvantages through examples.   7

(c) Explain Booth algorithm for multiplication of signed 2′ complement numbers.   7

(d) What is the difference between combinational ALU & sequential ALU ?   7

Q. 3. (a) What prevents RISK pipeline to achieve maximum speed ?   2

(b) What are the design parameters for pipeline processor? Discuss the briefly with example.   7

(c) Explain the difference between hardwired control and micro-programmed control. Is it possible to have a hardwired control associated with a control memory?   7

(d) Write a short note on microinstruction and write the necessity of grouping of signals. 7

Q. 4. (a) What are the difference between Static memory & Dynamic memory?   2

(b) Draw and explain direct mapping cache.

What is the disadvantage of direct mapping ?　　　7

(c) How many 128 bytes RAM chips are required to provide a memory of 2048 bytes ? Show details of connection clearly indicating address data & decoder configuration.　　　7

(d) A block set associative cache memory consist of 128 blocks divided into four block sets. The main memory consists of 16,384 blocks and each block contains 256 eight bit words.　　　7

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(6)

(i) How many bits are required for

addressing the main memory ?

(ii) How many bits needed to represent the

TAG, SET, WORD fields ?

Q. 5. (a) What is meant by software for programmed

I/O ?   2

(b) Draw and explain the block diagram of

typical DMA controller.   7

(c) Write short notes on :   7

(i) Fault tolerant system

(ii) Multiprocessor

(d) What is the basic advantage of using interrupt-initiated data transfer over transfer under program control without an interrupt ? 7

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4,390

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B. E. (Fourth Semester) Examination April-May 2021

(New Scheme)

(CSE Branch)

COMPUTATIONAL MATHEMATICS

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

*Note : Attempt all questions. Part (a) of each question is compulsory and carries 2 marks. Attempt any **two** parts from (b), (c) and (d) which carry 7 marks each.*

Unit - I

1. (a) Write the general formula for secant method.

   (b) Using Newton-Raphson method find the real root of the equation $x^2 - 5x + 2 = 0$ correct to four decimal places.

(c) Find a real root of the equation $x^3 - 11x^2 + 32x - 22 = 0$ by Birge-Vieta method using the initial approximation $p = 0.5$.

(d) Find the real root of the equation $xe^x - 2 = 0$ by the method of Regula-Falsi.

Unit - II

2. (a) State the condition for convergence of Gauss-Seidel method.

(b) Apply Crout's triangularization method to solve the equations :

$$3x + 2y + 7z = 4;$$

$$2x + 3y + z = 5;$$

$$3x + 4y + z = 7$$

(c) Use relaxation method to solve the system of equations :

$$12x + y + z = 31$$

$$2x + 8y - z = 24$$

$$3x + 4y - 10z = 58$$ 7

(d) Use Gauss Seidel iteration method to solve the

system of equations.

$$6x + 15y + 2z = 72$$

$$x + y + 54z = 110$$

$$27x + 6y + z = 85$$

Unit - III

3. (a) Write the Bessel's formula.

(b) Given $\sin 45° = 0.7071$ $\sin 50° = 0.7660$, $\sin 55 = 0.8192$, $\sin 60° = 0.8660$, find $\sin 52°$, using Newton's interpolation formula.

(c) Given $\tan 0° = 0$, $\tan 5° = 0.0875$, $\tan 10° = 0.1763$ $\tan 15° = 0.2679$, $\tan 20° = 0.3640$, $\tan 25° = 0.4663$ $\tan 30° = 0.5774$. Using stirling's formula, show that $\tan 16° = 0.2867$.

(d) Using Newton's divided difference formula, find the values of $f(8)$ and $f(15)$ given :

x	4	5	7	10	11	13
$f(x)$	48	100	294	900	1210	2028

Unit - IV

4. (a) Define Quadrature formula.

(b) Find the first and second derivatives of the function tabulated below, at the point $x = 1.5$.

x	1.5	2.0	2.5	3.0	3.5	4.0
$f(x)$	3·375	7·000	13·625	24·000	38·875	59·006

(c) A river is 80 meter wide. The depth 'd' in metres at a distance x metres from one back is given by the following table.

x	:	0	10	20	30	40	50	60	70	80
d	:	0	4	7	9	12	15	14	8	3

Find the approximate area of cross-section of the river.

(d) Using Simpson's 1/3rd rule evaluate $\int_0^1 \dfrac{dx}{1+x^2}$ and also find the approximate value of π.

Unit - V

5. (a) Explain Picard's method.

(b) Using Runge-Kutta method find the value of y at $x = 0.1$ given $\dfrac{dy}{dx} = 3x + y^2$ and $y(0) = 1$.

(c) Using Adam-Bashforth formula determine $y(0.4)$.

Given the differential equation $\dfrac{dy}{dx} = \dfrac{1}{2}xy$ and the data :

x	0	0·1	0·2	0·3
y	1	1·01	1·022	1·023

(d) Apply Euler's method to find $y(0.4)$ from the differential equation $\dfrac{dy}{dx} = xy$, and $y(0) = 1$. Take for each step $b = 0.1$.

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B. E. (Fourth Semester) Examination, April-May 2021

(New Scheme)

(CSE Branch)

DISCRETE STRUCTURES

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : In each question Part (a) is compulsory and carries 2 marks. Solve any two part from (b), (c) and (d) each carry 7 marks.

Unit-I

1. (a) State and explain Boolean algebra.

(b) Write the following functions into disjunctive normal form of 3 variables x, y, z

(i) $x' + y'$

(ii) $(x+y)(x'+z')$

(c) Prove that the structure $(B, +, \cdot, ')$ is a Boolean algebra where $B = \{0, 1\}$ and $+$ and $\cdot$ are two binary operation and (') a unary operation of B, defined by the following tables

+	0	1
0	0	1
1	1	1

$\cdot$	0	1
0	0	0
1	0	1

a	a'
0	1
1	0

Table 1   Table 2   Table 3

(d) Draw the switching circuit of each of the following function and replace them by Simpler one's :

(i) $F(x, y, z) = x \cdot y + \left[z \cdot (x' + y') \right]$

(ii) $F(x, y, z) = (x + y + z) \cdot (x' + y)$

Unit-II

2. (a) State and explain types of Binary relations.

(b) If I is the set of integers and the relation $x \, R y \Rightarrow x - y$ is an even integer then prove that R is an equivalence relation where $x, y \in I$.

(c) Show that the function $f : R \to R$ defined by $f(x) = 3x + 5$ is one-one onto where R is the set of real numbers.

(d) If L be the set of all factors of 12 and let "1" be the divisibility relation on L. Show that $(L, 1)$ is a lattice.

Unit-III

3. (a) State and explain Group.

(b) Prove that the set fourth roots of unity (namely, $1, -1, i, -i$) form an abelian group with respect to multiplication.

(c) Prove that set of all integers I is a ring with composition of addition and multiplication.

(d) If G be the multiplicative group of the set $\{1, -1\}$ and G' be the additive group of residue class modulo 2 i.e. $G' = \{(0,1), +2\}$ then show that there are isomorphic group.
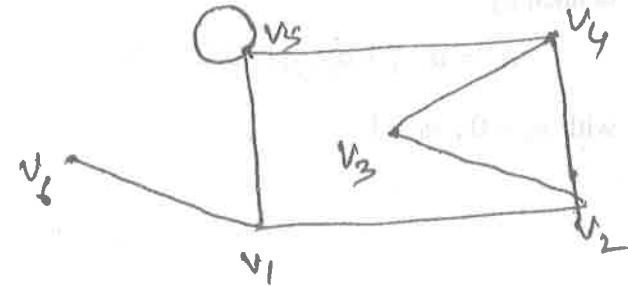
Unit-IV

4. (a) State and explain Binary tree.

(b). (i) Prove that sum of the degree of all vertices in a Graph G is equal to twice the number of edges in G.

(ii) Prove that the vertices of odd degree in a graph is always even

(c) (i) Draw the graph whose incidence matrix M is given by :

$$M = \begin{array}{c} \\ v_1 \\ v_2 \\ v_3 \\ v_4 \\ v_5 \end{array} \begin{array}{cccccc} e_1 & e_2 & e_3 & e_4 & e_5 & e_6 \\ \left[\begin{array}{cccccc} 1 & 0 & 0 & 0 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 & 0 \end{array}\right] \end{array}$$

(ii) Write the adjacency matrix of the graph shown in fig. below.

(d) Find the maximum and minimum possible height of a binary tree with 13 vertices and draw graph of the tree.

Unit-V

5. (a) Find the generating functions of the numeric function

$$a_r = 7 \cdot 3^r, r \geq 0$$

(b) How many positive inteters not exceeding 500 are divisible by 7 or 11?

(c) Solve the difference equation
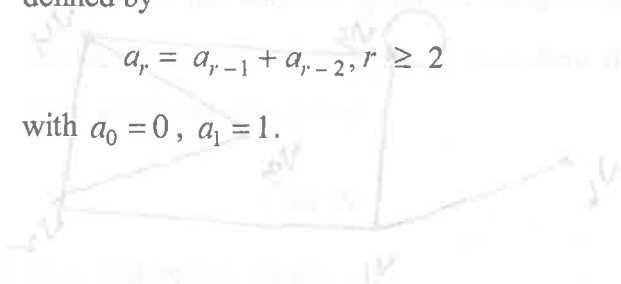
$$a_{r+2} - 5 a_{r+1} + 6 a_r = 5^r$$

(d) Find the generating function for the sequence $\{ a_r \}$ defined by

$$a_r = a_{r-1} + a_{r-2}, r \geq 2$$

with $a_0 = 0$, $a_1 = 1$.

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B. E. (Fourth Semester) Examination, April-May 2021

(New Scheme)

(CSE Engg. Branch)

DATA STRUCTURES

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Attempt all questions. Part (a) of each unit is compulsory and carries 2 marks. Attempt any *two* parts from (b), (c) and (d) each question and carries 7 marks.

Unit-I

1. (a) What do you mean by data structure and need to study it.

(b) What are asymptotic notations? Explain about $0(h)$ notation, $\Omega(h)$ notation and $\theta(h)$ notation.

(c) (i) Write an algorithm to insert a node at n^{th} position in a single linked list.

(ii) Write an algorithm to delete a node from the beginning in a doubly linked list.

(d) Write algorithm for insertion and deletion in one diamensional array and state it any disadvantage associated with it.
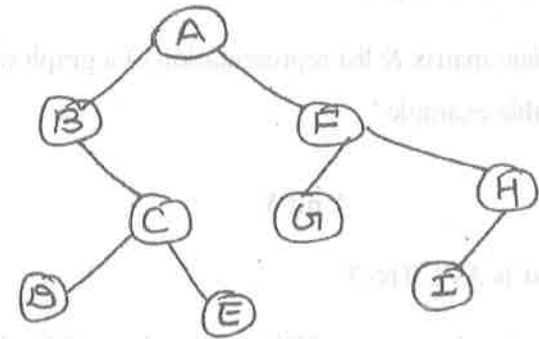
Unit-II

2. (a) Evaluate the following :

(i) $5\ 6\ 2 + * \ 12\ 4\ /\ -$

(ii) $-\ *\ 5 + 6\ 2\ /\ 12\ 4$

(b) Write an algorithm to convert in fix expression to postfix, support your answer with example.

(c) What is Recursion? Explain Tower of Hanoi algorithm with example.

(d) What is queue data structure? Write algorithm to

insert element in a queue. Support your answer with example.

Unit-III

3. (a) Convert the following tree in postorder and inorder traversal.

(b) Explain threaded binary tree with suitable example.

(c) Construct binary tree from given post order and inorder traversal.

Post order : D F E B G L J K H C A

Inorder : D B F E A G C L J H K

(d) Write an explain Huff man algorithm and explain its use.

Unit-IV

4. (a) Define directed graph with example.

   (b) Explain BFS (Breadth First Search) algorithm with example.

   (c) Explain prim's algorithm for finding minimal spanning tree with example.

   (d) Explain matrix & list representation of a graph with suitable example.

Unit-V

5. (a) What is AVL Tree?

   (b) What is advantages of Binary search tree? Explain with suitable example.

   (c) Explain insertion sort algorithm supporting with example.

   (d) Explain quicksort algorithm with its complexity.

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B. E. (Fourth Semester) Examination, April-May 2021

(New Scheme)

(CSE Engg. Branch)

COMPUTER SYSTEMS ARCHITECTURE

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

*Note : Part (a) is compulsory from each unit. Attempt any **two** from part (b), (c) and (d).*

Unit-I

1. (a) Name the functional units of computer.   2

(b) A two word instruction is stored in memory at an address designated by the symbol W. The address field of the instruction (stored at W + 1) is designated by the symbol Y. The operand used during the execution of the instruction is stored at an address symbolized by Z. An index register contains the value X. State how Z is calculated from the other address if the addressing mode of the instruction is :

(i) direct

(ii) indirect

(iii) relative

(iv) indexed 7

(c) Explain the microprogrammed control unit with neat and clean diagram. 7

(d) Explain the subroutine with parameter passing using a program. 7

Unit-II

2. (a) Define guard and rounding bits. 2

(b) Multiply A = 110101 and B = 011011 using Booth Algorithm. 7

(c) Explain the working of carry lookahead adder with a neat diagram. 7

(d) Show the contents of registers E, A, Q and SC during the process of division of two fixed point binary numbers in signed magnitude representation 10100011 by 1011. 7

Unit-III

3. (a) Define Cache memory. 2

(b) Explain the associative memory organization and derive the expression for match logic. 7

(c) What do you mean by virtual memory? An address space is specified by 24 bits and corresponding memory space by 16 bits :

(i) How many words are there in the address space?

(ii) How many words are there in memory space?

(iii) If a page consists of 2 K words, how many pages and blocks are these in the system? 7

(d) Explain the direct memory mapping used in Cache organization with diagram. 7

Unit-IV

4. (a) Define interrupt.   2

   (b) Define priority interrupt. Explain daisy-chaining priority interrupt with block diagram.   7

   (c) Explain the working of asynchronous communication interface with block diagram.   7

   (d) Explain the working of DMA (Direct Memory Access) with neat diagram.   7

Unit-V

5. (a) What do you understand by Parallel processing?   2

   (b) A non-pipeline system takes 50 ns to process a task. The same task can be processed in a six-segment pipeline with a clock cycle of 10 ns. Determine the speed-up ratio of the pipline for 100 tasks. What is the maximum speed-up that can be achieved?   7

   (c) Explain the architecture pipeline in detail.   7

   (d) Write short notes on :

      (i) Vector processor   3½

      (ii) Array processor   3½

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B. E. (Fourth Semester) Examination, April-May 2021

(New Scheme)

(CSE Branch)

OBJECT ORIENTED CONCEPTS &

PROGRAMMING using C++

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

*Note : Attempt all questions. Part (a) of each question is compulsory and carries 2 marks. Attempt any **two** parts from (b), (c) and (d) which carry 7 marks each.*

Unit-I

1. (a) What is Data Hiding?   2

    (b) What is the difference between procedural oriented programming and object oriented programming?   7

(c) What is Class and Object? 7

(d) Explain the following :

   (i) Encapsulation 3.5

   (ii) Polymorphism 3.5

Unit-II

2. (a) What do you mean by static data member? 2

(b) Explain the following :

   (i) Hierarchy of console stream classes 3.5

   (ii) Use of console keyword 3.5

(c) What is Friend Class? Explain with example. 7

(d) Explain access specifiers with example. 7

Unit-III

3. (a) What is Pointer? 2

(b) What is construction with its types and example? 7

(c) Write a program in C++ to read two numbers from the keyboard and display larger value on the screen. 7

(d) What is this pointer with example? 7

Unit-IV

4. (a) Define type conversion in short. 2

(b) Explain various types of inheritance. 7

(c) What are the ambiguities in inheritance and how to resolve it? 7

(d) Write a program to overload '+' operator to add two complex number. 7

Unit-V

5. (a) What is Template? 2

(b) Explain early binding and late binding. 7

(c) Explain virtual function with example. 7

(d) Explain the concept of exception handling. 7

322456(22)

B. E. (Fourth Semester) Examination, April-May ~~2020~~ 2021

(New Scheme)

(CSE Branch)

OPERATING SYSTEM

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Attempt all questions. Part (a) of each question is compulsory and carries 2 marks. Attempt any **two** parts from (b), (c) and (d) which carry 7 marks each.*

Unit-I

1. (a) Define Operating System.

   (b) Explain Batch OS and Time Sharing OS in detail.

(c) Explain different Input Output trends.

(d) Explain distributed computing trends with suitable examples.

Unit-II

2. (a) Define a Process.

(b) Calculate the Avg. Waiting time for the given snap-shot, it all the processes have arrived at time 0 to CPU, using : SJF, Round Robin and Priority scheduling algorithm (Time quantum = 1 ms).

Process	Bust time	Priority
P_1	8	4
P_2	6	1
P_3	1	2
P_4	9	2
P_5	3	3

(c) What is Critical Section Problem? Explain Semaphores with an example.

(d) Explain producer consumer problem with its solution.

Unit-III

3. (a) Define Deadlock.

(b) Explain the necessary conditions for the deadlock to occur. Also explain Resource Allocation Graph.

(c) Consider the following snapshot of the system :

	Allocation	Max	Available
	ABCD	ABCD	ABCD
P_0	0 0 1 2	0 0 1 2	1 5 2 0
P_1	1 0 0 0	1 7 5 0	
P_2	1 3 5 4	2 3 5 6	
P_3	0 6 3 2	0 6 5 2	
P_4	0 0 1 4	0 6 5 6	

Answer the following using Banker's algorithm :

(i) What is the content of NEED matrix?

(ii) Is the system in a safe state?

(iii) If a request from process P1 arrives for (0, 4, 2, 0) can the request be granted immediately?

(d) Explain briefly different options for breaking a deadlock.

Unit-IV

4. (a) Define Memory.

(b) Explain the concept of Paging with segmentation.

(c) Give memory partitions of 100 kb, 500 kb, 200 kb, 300 kb and 600 kb (in order), how would each of the first fit, best fit and worst fit algorithms place processes of 212 kb, 417 kb, 112 kb and 426 kb (in order)? Which algorithm makes the most efficient use of the memory?

(d) Consider a reference string : 4, 7, 0, 7, 1, 0, 1, 2, 1, 2, 7, 1, 2. The number of frames in the memory is 3. Find out the number of page faults using : optimal, FIFO and LRU page replacement algorithm.

Unit-V

5. (a) Define a File.

(b) Write a brief note on UNIX os.

(c) Explain the file organization and access mechanism in windows os.

(d) Suppose that a disk drive has 5000 cylinders (0 to 4999). The drive is currently serving a cylinder 143, and the previous request was at 125. The queue of pending request in order is : 86, 1470, 913, 1174, 948, 1509, 1022, 1750, 130. Starting from the current position calculate the total head movement to satisfy the pending requests using : FCFS, SCAN and LOOK disc scheduling algorithm.

B022411(014)

B. Tech. (Fourth Semester) Examination, April-May 2021

(AICTE Scheme)

(CSE Engg. Branch)

DISCRETE MATHEMATICS

Time Allowed : Three hours

Maximum Marks : 100

Minimum Marks : 35

Note : Part (a) of each question is compulsory and carries 4 marks each. All questions are required to be answered, selecting any two from (b), (c) and (d) and carries 8 marks each.

1. (a) Construct converse, inverse and contrapositive of the direct statement :

    "If $4x - 2 = 10$ then $x = 3$."

   (b) Test the validity of the argument :

"If 8 is even then 2 does not divide 9. Either 7 is not prime or 2 divides 9. But 7 is prime therefore 8 is odd."

(c) State and prove De-Morgan's law in a Boolean algebra $(B, +, \cdot, ')$.

(d) Change the following boolean function to disjunctive normal form and conjuctive normal form :

$$f(x, y, z) = (x + y + z)(xy + x'z)'$$

2. (a) Let $A = \{1, 2, 4\}$, $B = \{2, 5, 7\}$ and $C = \{1, 3, 7\}$, then show that

$$A \times (B \cap C) = (A \times B) \cap (A \times C)$$

(b) If I is the set of integers and the relation

' $xRy \Leftrightarrow x - y$ is an even integer'.

then prove that R is an equivalence relation, where $x, y \in I$.

(c) Show that the inclusion relation '$\subseteq$' is a partial

ordering on the power set $P(s)$ and draw the Hasse diagram for the partial ordering $\{(A, B) \mid A \subseteq B\}$.

(d) If $f : X \to Y$ be a one-one and auto mapping then prove that

$$f \circ f^{-1} = I_y \text{ and } f^{-1} \circ f = I_x$$

where I_x and I_y are identity mappings of X and Y respectively.

3. (a) Prove that every cyclic grup is an abelian group.

(b) Let Q_+ be the set of all positive rational numbers and * is a binary operation on Q_+ defined as
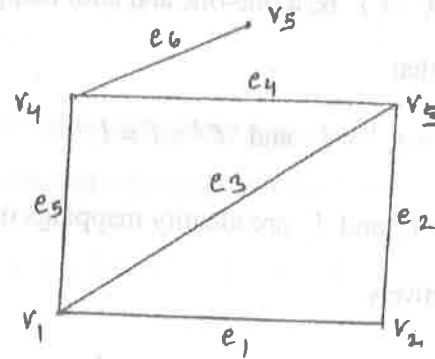
$$a * b = \frac{ab}{3}, \forall a, b \in Q_+$$

show that $(Q_+, *)$ is a group.

(c) State and prove lagrange's theorem.

(d) Prove that every field is an integral domain.

4. (a) Define incidence matrix and find the incidence matrix of the following graph :
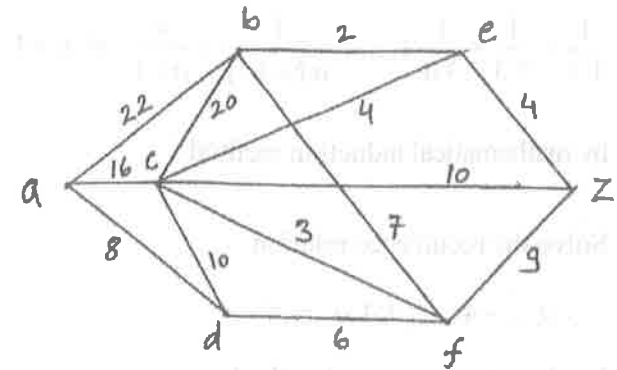

(b) (i) Prove that the sum of the degrees of odd vertices in a graph is always an even number.

(ii) Prove that the maximum number of edges in a simple graph with n vertices is $\dfrac{n(n-1)}{2}$.

(c) Find the shortest path between a and z for the graph given below, where the numbers associated with the edge are the distances between vertices :

(d) Find a minimal spanning tree of the graph :

5. (a) State generalized pigeonhole principle. Show that if seven colours are used to paint 50 cars, atleast eight cars will have the same colour.

(b) Show that :

$$\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + ... + \frac{1}{n.(n+1)} = \frac{n}{n+1}, \forall\, n \geq 1$$

by mathematical induction method.

(c) Solve the recurrence relation

$$a_{r+2} - 4\,a_{r+1} + 4\,a_r = r^2$$

by characteristics root method.

(d) Solve by the method of generating functions, the recurrence relation

$$a_r - 5\,a_{r-1} + 6\,a_{r-2} = 2,\, r \geq 2$$

with the boundary conditions $a_0 = 2$ and $a_1 = 2$.

B022412(022)

B. Tech (Fourth Semester) Examination, April-May 2021

(Computer Science and Engg. Branch)

COMPUTER SYSTEM ARCHITECTURE

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt all question. Part (a) of all questions is compulsory. Attempt any two parts from (b), (c) and (d). The figure in the right-hand margin indicate marks.

Unit-I

1. (a) Who controls the buses in DMA data transfer and how?   4

    (b) What do you understand by a subroutine? Discuss about parameter passing in subroutines.   8

(c) Write the differences between Hardwired and Micro programmed control unit. Draw the block diagram of both. 8

(d) An instruction is stored at location 300 with its address field at location 301. The address field has the value 400, a processor register $R1$ contain the number 200. Evaluate effective address if the addressing mode of the instruction are 8

(i) direct

(ii) immediate

(iii) relative

(iv) register indirect

Unit-II

2. (a) In a computer with 48-bit words, one bit is reserved for the sign. What will be the range of fixed-point integer number? 4

(b) Describe a technique used to make the process of addition and subtraction by 2's complement number faster. 8

(c) Explain Booth multiplication alongwith for 2's complement number using flow chart and example. 8

(d) Evaluate the following by using Restoring Division: Divisor is 11 and Divided is 1000. 8

Unit-III

3. (a) Define the principle of locality of references. Which parameter is used to evaluate the performance of cache memory? 4

(b) The access time of cache memory is 100 ns and that of main memory 1000 ns. It is estimated that 80% of the memory request for read and remaining for write. The hit ratio for read access only is 0.9. A write through procedure is used. 8

(i) What is the average access time of system considering only memory read?

(ii) What is the average access time of system for both read and write required?

(c) What do you mean by virtual memory? An address space is specified by 24 bits and corresponding memory space by 16 bits. 8

(i) How many word are there in the address space?

(ii) How many words are there in the memory space?

(iii) If a page consists of 2K words, how many pages and blocks are there in the system?

(d) Explain the working of associative memory with

block diagram and derive the expression for match
logic.   8

Unit-IV

4. (a) How Daisy Chaining priority interrupt works?   4

(b) Explain the direct memory access scheme alongwith
its advantages for data transfer between external
devices and the main memory.   8

(c) Explain in detail about the structure of a magnetic
disk system. Also mention how we can find its
capacity.   8

(d) What do you understand by computer peripherals?
Explain with proper explanation any two computer
peripherals.   8

Unit-V

5. (a) Specify a pipeline configuration to carry out

arithmetic operation $(A_i + B_i)(C_i + D_i)$ 4

(b) Consider the execution of the program 15000
instruction a linear pipeline processor with a clock
rate of 25 MHz. Asume that the instruction pipeline
has 5 stages and that one instruction is issued per

clock cycle. Calculate   8
(i) speed up factor
(ii) efficiency
(iii) throughout.

(c) What do you understand by parallel processing?
Describe Flynn's classification of parallel processing.   8

(d) What is the use of pipelining? Prove that an M-
stage linear pipeline can be at most M times faster
than that of non-pipelined serial processor.   8

B022413(022)

B.Tech. (Fourth Semester) Examination
April-May 2021

(CSE Branch)

DATABASE MANAGEMENT SYSTEM

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : *Attempt all questions. Attempt any two parts from (a), (b) and (c) of each unit. Each part carries 10 marks.*

Unit-I

1. (a) Explain the purpose of database systems. Differentiate DBMS versus file system.

(b) Discuss three levels architecture in DBMS.

(c) Write about Relational Model. Also explain the concept of keys with the help of suitable example.

Unit-II

2. (a) Explain join operators used in Relational Algebra.

(b) Consider the relational database

employee(person-name,street,city)

works(person-name,company-name,salary)

company(company-name,city)

managers(person-name,manager-name).

Give an expression in the relational algebra for each request :

(i) Modify the database so that Jones now lives in Newtown.

(ii) Give all employees of First Bank Corporation a 10 percent salary raise.

(iii) Give all managers in this database a 10 percent salary raise.

(iv) Give all managers in this database a 10 percent salary raise, unless the salary would be greater than $100,000. In such cases, give only a 3 percent raise.

(v) Delete all tuples in the works relation for employees of Small Bank Corporation.

(c) Define Normalization. Explain 3NF and BCNF.

Unit-III

3. (a) Explain the steps in query processing by giving appropriate example.

(b) What is evaluation plan and equivalence rules in Query optimization.

(c) Write notes on : (any **two**)

(i) Indices

(ii) B-Trees

(iii) Hashing

Unit-IV

4. (a) Define Transaction. Write ACID properties of Transaction.

(b) What are Concurrent Schedules? Write in detail about serializability.

(c) What is concurrency control mechanism? Explain Multi-version and Concurrency Control scheme.

Unit-V

5. (a) What are the three pillars of security? Explain DAC, MAC and RBAC.

(b) What is SQL Injection? How SQL Injection works and its defense mechanism?

(c) Write notes on : (any **two**)

   (i) Web databases

   (ii) Distributed databases

   (iii) Data warehousing and data mining

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B022414(022)

B. Tech. (Fourth Semester) Examination
April-May 2021

OBJECT PROGRAMMING (with Java)

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Questions no. (a) is compulsory and attempt any two questions from (b), (c) and (d).

Unit-I

1. (a) Give the name of top class of all the classes in java and top package which is default pacakage.   4

    (b) Java is not a 100% pure object oriented programming language. Explain with suitable example.   8

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[2]

(c) Write a program taking input from user 1 to 3 and
do the following :   8

   (i) If the input is 1 call the default constructor.

   (ii) If the input is 2 call the constructure with one
integer parameter.

   (iii) If the input is 3 call the constructor with one
string parameter.

(d) What is JVM? Also explain the role of Garbage
Collector with suitable program.   8

Unit-II

2. (a) Give uses of super in Java.   4

(b) Differentiate between Abstract class and Interface
with example.   8

(c) Find the output of the two following code :   8

   (i) public class test

```
{
    public static void main (String [ ] args)
    {
        try
        {
```

[3]

```
            System.out.printf ("1") ;
            int sum = 9 / 0 ;
            System.out.printf ("2") ;
        }
        catch (Artithmetic Expception e)
        {
            System.out.printf ("3") ;
        }
        catch (Expception e)
        {
            System.out.printf ("4") ;
        }
        finally
        {
            System.out.printf ("5") ;
        }
    }
}
```

   (ii) public class test

```
{
    private void m1( )
    {
        m2 ( );
```

```
        System.out.printf ("1") ;
    }
    private void m2 ()
    {
        m3 ();
        System.out.printf ("2") ;
    }
    private void m3 ()
    {
        System.out.printf ("3") ;
        try
        {
            int sum = 4 / 0 ;
        System.out.printf ("4") ;
        }
    catch (Arithmetic Exception e)
        {
        System.out.printf ("5") ;
        }
        System.out.printf ("7") ;
    }
    public static void main (String [ ] args)
    {
```

```
        Test obj = new Test () ;
        obj.m1 () ;
    }
}
```

(d) Write a program in Java to demonstrate user throw. Also explain checked throw. Also explain checked and unchecked exception.   8

Unit-III

3. (a) Which one is the master class of exceptions?   4

(b) Explain the concept of Lock in java. Also explain Thread Priority.   8

(c) Explain string and string buffer class. What is mutable and immutable in java?   8

(d) Explain Inter Thread Communication. :What is Daemon Thread?   8

Unit-IV

4. (a) What is the functioning of who is?   4

(b) Write a program to add 2 numbers using Applet.   8

(c) Explain all types of JDBC Bridge drivers.   8

(d) Write a program using inter address class and show
the utility of URL and URL connection classes.   8

Unit-V

5. (a) What is AWT?   4

(b) Explain Event Delegation Model.   8

(c) How do you retrieve all keys present in a Hash
Map?   8

(d) Write the steps of creating and running executable
JAR files in java.   8

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B022415(022)

B. Tech. (Fourth Semester) Examination, April-May 2021

(AICTE Scheme)

(Computer Science Engg. Branch)
DESIGN & ANALYSIS OF ALGORITHMS

Time Allowed : Three hours

Maximum Marks : 100

Minimum Marks : 35

Note : Answer all questions. Part (a) of each question is compulsory and of 4 marks. Answer any two parts from part "b", "c" and "d", which is of 8 marks each.

1. (a) What are the fundamental steps involved in problem solving using algorithm.

    (b) Explain the Asymptotic notations used in designing algorithms.

(c) Write the algorithm of Insertion Sort and analyze this.
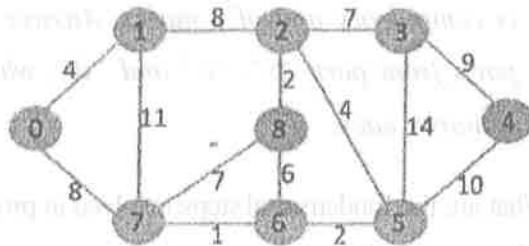
(d) Solve the following recurrences.

(i) $T(n) = T(n/2) + T(n/4) + T(n/8) + n$

(ii) $T(n) = T(n-2) + 2\lg n$

2. (a) Write the general plan for divide-and-conquer algorithms. Write any four example of divide-and-conquer.

(b) Write the algorithm of Quick Sort and analyze it.

(c) Find the minimum spanning tree using Kruskal algorithm for the following graph.

(d) Solve the Knapsack problem using Greedy algorithm, for the following data.

Item	A	B	C	D
Profit	280	100	120	120
Weight	40	10	20	24

where $W = 60$.

3. (a) What is Dynamic programming? Write the steps of Dynamic Programming.

(b) Find Longest Common subsequence of X and Y, where X = A, B, C, B, D, A, B and Y = B, D, C, A, B, A.

(c) Find the pattern in the given text by using Boyer Moore algorithm, where Text : "G C A A T G C C T A T G T G A C C" and Pattern : 'T A T G T G'.

(d) Write any one application of string matching algorithm. Which string matching algorithm you will use for this? How you will think that your selected algorithm is better than other string matching algorithm.
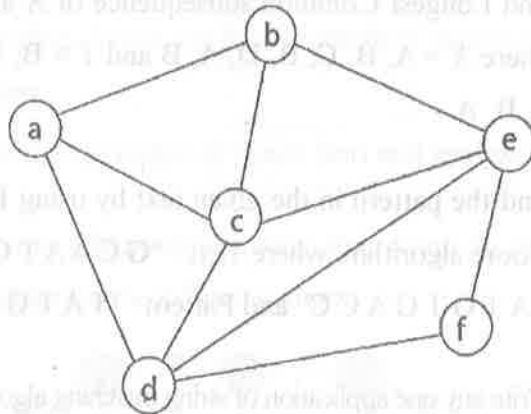
4. (a) Explain Backtracking and recursive backtracking.

(b) Write the rules of 8-queen problem. Find any one

solution of 8-queen problem by using backtracking.

(c) Find the solution for the sum of subsets problem

with the set $S = \{3,4,5,6,10\}$ with $M = 9$ using

backtracking method.

(d) Find the Hamiltonian cycle for the given graph using backtracking.

5. (a) Define Branch-and-Bound method with different types of nodes used.

(b) Solve the 0/1 knapsack problem using Branch and Bound with following data :

Items	Weight	Value
11	3	4
12	4	5
13	5	6

where $W = 7$.

(c) Explain FIFO Branch and Bound and LC Branch and Bound, with example.

(d) Write short notes on any **two** :

   (i)   Cook's theorem

   (ii) NP Complete Classes

   (iii) NP Hard Classes