UCSL206

G. H. Raisoni College of Engineering, Nagpur

(An Autonomous Institution)

Third Term B.Tech. Artificial Intelligence/Data Science

End Semester Examination : Winter-2021

Operating System

Time : 2 hrs.] **[Max. Marks : 50**

Instruction:

1) All questions carry marks as indicated
2) Assume suitable data wherever necessary.
3) Due credit will be given to neatness and adequate dimensions.
4) Illustrate your answer wherever necessary with the help of neat sketches.
5) Use of non-programmable calculator is permitted.

Q. NO	Question	Marks	COs
1 (A)	Explain distinguished features of i) Time-sharing system ii) Parallel processing iii) Real time operating system	**6**	**CO1**
1(B)	Define Operating systems. Discuss its role with user and system view points	**4**	**CO1**
2(A)	Describe Process state diagram	**3**	**CO2**
2(B)	Compare Preemptive and Non-Preemptive Shortest Job First scheduling w. r. t. Waiting time (WT) and Turnaround time (TAT) for the following data. **Process** / **Arrival Time** / **CPU Burst** P1 / 00 / 05 P2 / 03 / 01 P3 / 07 / 02 P4 / 10 / 04 P5 / 15 / 03	**7**	**CO2**
3(A)	Discuss critical section problem? Illustrate this problem with suitable example.	**5**	**CO3**
3(B)	Explain the synchronizing protocol of a classical readers/writers problem.	**5**	**CO3**
4(A)	What are the necessary conditions for deadlock to occur?	**5**	**CO4**
4(B)	Describe Bankers algorithm with example.	**5**	**CO4**
5(A)	Write a note on file types and file structures	**5**	**CO5**
5 (B)	Consider the following page reference string 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6 Find out the number of page faults if there are 4 page frames, using the FIFO page replacement algorithm	**5**	**CO5**

BFYL141

G. H. Raisoni College of Engineering, Nagpur

(An Autonomous Institution)

END SEMESTER EXAMINATION WINTER-2021 (ONLINE MODE)

Third Semester B.Tech CSE/IT/AI

Discrete Mathematics

Time: 2 hr.] **[Max. Marks:50**

1) [CO1/CO2/CO3] indicates the question related to specific course outcome.
2) All questions carry marks as indicated
3) Due credit will be given to neatness and adequate dimensions.
4) Illustrate your answer wherever necessary with the help of neat sketches.
5) Use of non-programmable calculator is permitted.

Q. No.		Questions	Marks	COs
1	a	In a group of 400 people, 250 can speak in English only and 70 can speak Hindi only. (i) How many can speak English? (ii) How many can speak Hindi? (iii) How many can speak both Hindi and English?	6	CO1
	b	Using Mathematical Induction ,Prove $\mathbf{1^2 + 2^2 + 3^2 + \ldots + n^2 = \frac{n(n+1)(2n+1)}{6}}$	6	CO1
	c	If R be a relation in a set of integers Z defined by $R = \{(x, y): x, y \in Z, (x - y) is\ multiple\ of\ 11\}$. Show that it is equivalence relation.	6	CO1
2	a	State and prove Lagrange's Theorem.	6	CO2
	b	Prove that the set of fourth root of unity forms a multiplicative abelian group.	6	CO2
	c	Show that if *a*, *b* are arbitrary elements of group G, then $(ab)^2=a^2b^2$ if and only if G is abelian.	6	CO2
3	a	Draw logic gate for the expression $\boldsymbol{a'b'(c\,d' + c'd') + a'b'(c' + d)(c + d')}$.	4	CO3
	b	Simplify the Boolean expression : X + Y (X + Y) +X (X' + Y).	4	CO3
	c	Draw Hasse's diagram for the poset $(P(S), \subseteq)$ where P(S) is the power set on $S = \{3,7,11\}$ and find its maximal, minimal, least and the greatest element.	6	CO3

G. H. Raisoni College of Engineering, Nagpur

(An Autonomous Institution)

Third Term B.Tech. CSE/IT/AI/DS

End Semester Examination : Winter - 2021

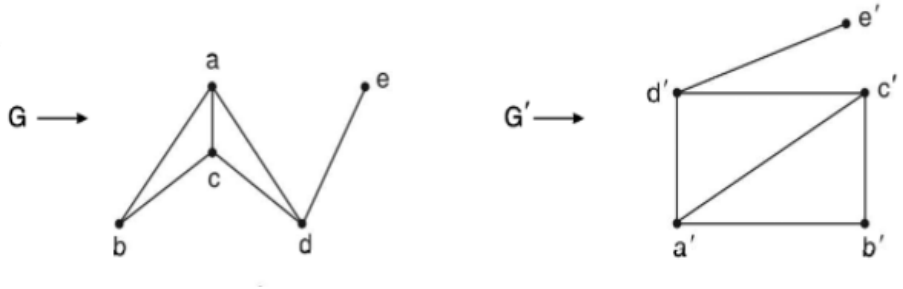
Discrete Mathematics and Graph Theory

Time: 2 hrs.] **[Max. Marks: 50**

Instructions:

1) All questions carry marks as indicated
2) Assume suitable data wherever necessary.
3) Due credit will be given to neatness and adequate dimensions.
4) Illustrate your answer wherever necessary with the help of neat sketches.
5) Use of non-programmable calculator is permitted.

Q. No.		Questions	Marks	COs
1	a	A survey on a sample of 25 new cars, being sold at a local auto dealer was conducted to see which of three popular options air conditioning (A) radio (R) and power windows (W) were already installed. The survey found: 15 had air conditioning; 12 had radio; 11 had power windows; 5 had air condition and power windows; 9 had air condition and radio; 4 had radio and power windows; 3 had all three options. Find the number of cars that had (i) only air conditioning (ii) only one of the options (iii) none of the options.	4	CO1
	b	Let f: $R^+ \to R^+$ and g: $R^+ \to R^+$ be functions defined by $f(x) = \sqrt{x}$ and $g(x) = 3x + 1$ for all $x \in R^+$. Find $(g_o f)^{-1}$and $f^{-1}{}_o g^{-1}$and verify $(g_o f)^{-1} = f^{-1}{}_o g^{-1}$	4	CO1
2	a	Prove that the group $(\{0,1,2,3,4,5,6,7,8,9\}, +_{10})$ is a cyclic group. Hence find all the generators of the group.	5	CO2
	b	Define subgroup. Prove that: i) Intersection of two subgroups is a subgroup. ii) Any two right cosets of a subgroup are either disjoint or identical.	5	CO2
3	a	Are the following Lattice Isomorphic? Explain (i) D_6 and D_8 (ii) D_{30} and D_{72}	4	CO3
	b	Draw the logic gate and simplify the given Boolean expressions (AB'+A'B)(A+B)+AB(A'B+AB')'	4	CO3

4	a	Check whether the given graph is isomorphic or not:  	4	CO4
	b	Draw the binary tree and solve the given expressions: (4*4+5)/((2*3)-1)	4	CO4
5	a	Solve the recurrence relation using generating function: $a_{n+2} - 2a_{n+1} + a_n = 2^n$ with initial conditions $a_0 = 2, a_1 = 1$	4	CO5
	b	Find the generating function for the sequence 1, 2, 2^2, 2^3,……..	4	CO5
6	a	Solve the Diophantine equations : 54x+21y=906	4	CO6
	b	Evaluate the given infinite continued fraction : $[2; \overline{1,2}]$	4	CO6

UBSL255

G. H. Raisoni College of Engineering, Nagpur

(An Autonomous Institution)

Third Term B.Tech. CSE/IT/AI/DS

End Semester Examination : Winter - 2021

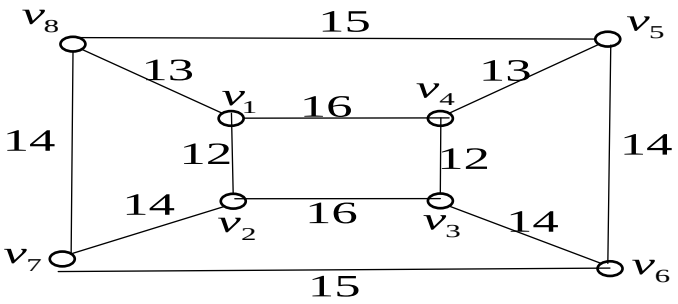
Discrete Mathematics & Graph Theory

Time: 2 hrs.] **[Max. Marks: 50**

Instructions:

1) All questions carry marks as indicated
2) Assume suitable data wherever necessary.
3) Due credit will be given to neatness and adequate dimensions.
4) Illustrate your answer wherever necessary with the help of neat sketches.
5) Use of non-programmable calculator is permitted.

Q. No.		Questions	Marks	COs
1	A	A set S consist of two types of elements: Type 1 and Type 2. Both Type 1 and Type 2 subsets are non-empty. A relation R on S is defined such that $(a, b) \in R$ only if a and b are of different types. Can such relation be reflexive, symmetric, transitive, and equivalent?	4	CO1
	B	Let $A = \{1, 2, 3\}$ and $B = \{8, 9\}$. Find whether the following subsets of $A \times B$ are functions from A to B. i) $f_1 = \{(1,8), (1,9), (2,8), (3,9)\}$. ii) $f_2 = \{(1,9), (2,9), (3,9)\}$. iii) $f_1 = \{(1,8), (2,9), (3,9)\}$. How many mappings are there of A into B? How many of these are one-one mappings? How many are onto?	4	CO1
2	A	Prove or disprove (i) Union of two subgroup is a subgroup (ii) Intersection of two subgroup is a subgroup.	4	CO2
	B	Find all the distinct left Cosets of H=6Z in the group (Z , +).	4	CO2
3	A	Let $(L, \leq)$ be any lattice, then for any a, b, c in L , show that : i) $a \vee (b \vee c) = (a \vee b) \vee c$ ii) $a \vee (a \wedge b) = a$.	4	CO3
	B	Let B be the set of all positive divisors of 30. For any $a, b \in B$, let $a + b = lcm(a, b)$; $a \bullet b = \gcd(a, b)$ and $a' = \frac{a}{30}$. Verify $(B, +, \bullet, ', 1, 30)$ is a Boolean algebra.	4	CO3

4	A	Find the minimum spanning tree of the weighted graph shown in following figure: 	4	CO4
	B	Define Complete diagraph. If there is no loop in a complete diagraph with n nodes then prove that the maximum number of edges it has is n (n – 1).	4	CO4
5	A	Solve the recurrence relation using generating function: $a_{n+1} = n+1+a_n$, $a_0 = 1$, $n \geq 0$.	4	CO5
	B	Prove that $\sum_{r=0}^{n} \binom{n^2}{r} = \binom{2n}{n}$, where *n* is positive integer.	4	CO5
6	A	Prove that value of any Infinite continued fraction is an irrational number.	5	CO6
	B	Evaluate the given infinite continued fraction : $[2; \overline{1,2}]$	5	CO6

Subject Code: UITL301

G. H. Raisoni College of Engineering, Nagpur

(An Autonomous Institute affiliated to Rashtrasant Tukdoji Maharaj Nagpur University)

Third Semester B.Tech (Artificial Intelligence/Data Science)
End Semester Examination Winter -2021
SOFTWARE ENGINEERING AND PROJECT MANAGEMENT

[Time: 2 hour] **[Max. Marks: 50]**

Instructions to Candidate

1) All questions carry marks as indicated
2) Assume suitable data wherever necessary.
3) Due credit will be given to neatness and adequate dimensions.
4) Illustrate your answer wherever necessary with the help of neat sketches.

Q. No.		Questions	Marks	CO
Q1	a)	Which characteristics to be considered for selection of life cycle model? How prototype model solves the problem of waterfall model?	5M	CO1
	b)	Illustrate the parameters and methods to check Software Requirement Specification SRS document for the requirement validation.	5M	CO1
Q2	a)	Compute Cyclomatic complexity by all three methods for finding greater number between two variables.	5M	CO2
	b)	Draw a level0 and level1 DFD(Data Flow Diagram) for Hospital Management System.	5M	CO2
Q3.	a)	What is risk management? How the risks are evaluated in software projects? List the factors involved in risk planning.	5M	CO3
	b)	Elaborate various components of Cost of Quality. Illustrate how this cost is justified in delivering quality software.	5M	CO3
		OR		
	b)	How many types of feasibility work for the cost estimation? How COCOMO model work for the cost estimation?	5M	CO3
Q 4	a)	Suppose you have to develop software for Student Management System. Draw an Activity and Use case diagram for the above.	5M	CO4
	b)	Illustrate with a numerical example the role of Earned value analysis in the project status reporting.	5M	CO4
Q.5	a)	Elaborate in detail about creating the framework for monitoring & control.	5M	CO5
	b)	You have been assigned as a project manager for a software project in testing phase. As a project manager what major activities will you perform?	5M	CO5

UITL301

G. H. Raisoni College of Engineering, Nagpur

(An Autonomous Institution)

Third Term B.Tech. Artificial Intelligence/ Data Science

End Semester Examination: Winter-2021

Software Engineering and Project Management

Time : 2 hrs.] **[Max. Marks : 50**

Instruction:

1) All questions carry marks as indicated
2) Assume suitable data wherever necessary.
3) Due credit will be given to neatness and adequate dimensions.
4) Illustrate your answer wherever necessary with the help of neat sketches.
5) Use of non-programmable calculator is permitted.

<table>
<tr><th>Q. No.</th><th>Question</th><th>Marks</th><th>COs</th></tr>
<tr><td>1 a)</td><td>A Software Engineering project depends significantly on team performance, as any activity that involves human interaction. What are your thoughts with this regard. Explain in detail.</td><td>5</td><td>CO 1</td></tr>
<tr><td>b)</td><td>Consider the following situation-
If the software development work indicates that the requirements of the software are changed frequently and also indicates the complex system development, then which software process model should be considered in this situation? Justify you answer and explain the software process model as well.</td><td>5</td><td>CO 1</td></tr>
<tr><td>2 a)</td><td>Which software estimation technique will be used for computing the following data. The project estimation is 400 KLOC.
<table>
<tr><th>Sr. No</th><th>Software Product Type</th><th>a</th><th>b</th><th>c</th><th>d</th></tr>
<tr><td>1.</td><td>Organic</td><td>2.4</td><td>1.05</td><td>2.5</td><td>0.38</td></tr>
<tr><td>2.</td><td>Semi detached</td><td>3.0</td><td>1.12</td><td>2.5</td><td>0.35</td></tr>
<tr><td>3.</td><td>Embedded</td><td>3.6</td><td>1.20</td><td>2.5</td><td>0.32</td></tr>
</table>
Calculate the effort and time respectively.</td><td>5</td><td>CO 2</td></tr>
<tr><td>b)</td><td>Consider a software application “Library Management System” containing three entities-
1. Student: wants to register into the system.
2. Library: wants to register into the system and update book details.
3. Administrator: responsible for the management of the transaction of fine and also login and register details.
Prepare a Software Requirement Specification Documentation including following points-</td><td>5</td><td>CO 3</td></tr>
</table>

<table>
<tr><td></td><td>1. Introduction
2. Overall Description
3. Use Case Diagram.</td><td></td><td></td></tr>
<tr><td>3</td><td>Draw a Use Case Diagram, Activity Diagram, Level-0 and Level -1 Data Flow Diagram (DFD) for Banking System.
OR
Draw a Use Case Diagram, Activity Diagram, Level-0 and Level -1 Data Flow Diagram (DFD) for Hospital Management System.</td><td>10</td><td>CO 3</td></tr>
<tr><td>4 a)</td><td>Compute the following data for calculating the function point, productivity, documentation, and cost per function.
Various processing complexity factors are: 4, 1, 0, 3, 3, 5, 4, 4, 3, 3, 2, 2, 4, and 5 respectively.
<table><tr><td>1.</td><td>Number of user inputs</td><td>24</td></tr><tr><td>2.</td><td>Number of user outputs</td><td>46</td></tr><tr><td>3.</td><td>Number of inquiries</td><td>8</td></tr><tr><td>4.</td><td>Number of files</td><td>4</td></tr><tr><td>5.</td><td>Number of external interfaces</td><td>2</td></tr><tr><td>6.</td><td>Effort</td><td>6.9 p-m</td></tr><tr><td>7.</td><td>Technical documents</td><td>265 pages</td></tr><tr><td>8.</td><td>User documents</td><td>122 pages</td></tr><tr><td>9.</td><td>Cost</td><td>Rs. 7744/ month</td></tr></table></td><td>5</td><td>CO 4</td></tr>
<tr><td>b)</td><td>When automated test tools need to be used? Write the purposes for which automated tests are not suitable.</td><td>5</td><td>CO 5</td></tr>
<tr><td>5</td><td>There is a requirement to develop a software application called as Student Management system for GHRCE. You are the team leader. Taking into consideration, the pandemic situation and strictly following all COVID protocols, how will you lead your team in developing this software application?
Justify your answer with respect to all the steps needed to develop a software.</td><td>10</td><td>CO 4</td></tr>
</table>

UAIL201

G H Raisoni College of Engineering, Nagpur

(An Autonomous Institution)

Third Term B. Tech. Artificial Intelligence

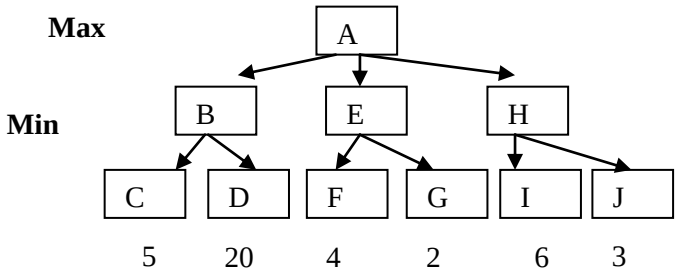
End Semester Examination : Winter-2021

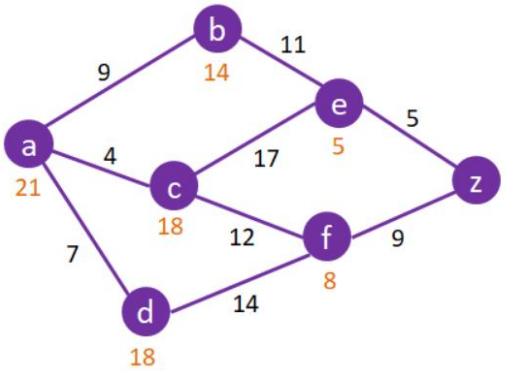
Artificial Intelligence: Knowledge Representation & Reasoning

Time: 2 hrs.] **[Max. Marks: 50**

Instruction:

1) All questions carry marks as indicated
2) Assume suitable data wherever necessary.
3) Due credit will be given to neatness and adequate dimensions.
4) Illustrate your answer wherever necessary with the help of neat sketches.
5) Use of non-programmable calculator is permitted.

Q. NO		Question	Marks	COs
1	a	For each of the following activities, give a PEAS description of the task environment a) Knitting a sweater b) Bidding on an item at an auction c) A medical diagnosis system d) A typing tutor e) An automated taxi	5	CO1
1	b	Differentiate between DFS Branch & Bound and IDA * Algorithms	5	CO1
2	a	Enlist the operators used in Genetic Algorithms. Solve the 8 queens problem using Genetic Algorithms. Let the number of Initial population be 5 and number of generations be 5.	5	CO2
2	b	Consider a game tree shown below. Calculate the values at the root of the tree using minimax algorithm. Perform alpha beta pruning to show which nodes will be pruned.  	5	CO2
3	a	Trace the constraint satisfaction procedure for solving the following cryptarithmetic problem CROSS + ROADS DANGER	5	CO3
3	b	Differentiate between backward chaining and forward chaining approaches used in logical inference algorithms	5	CO3

4	**a**	Apply the steps of the A* Search algorithm to find the shortest path from A to Z using the following graph: (Numbers in orange indicate Heuristic values and numbers in black indicate path cost)  	**5**	**CO4**
4	**b**	Find a solution to the following 8 puzzle problem using Start State 4 1 2 6 3 7 5 8 Goal State 1 2 3 4 5 6 7 8 a) Heuristic function as Manhattan distance b) Heuristic function as number of misplaced tiles Compare the performance of the resulting algorithms	**5**	**CO4**
5	**a**	Given the following, prove that the Unicorn is Mythical. If the unicorn is mythical, then it is immortal, but if it is not mythical then it a mortal mammal. If the unicorn is either immortal or a mammal, then it is horned. The unicorn is magical if it is horned.	**5**	**C05**
		OR		
5	**a**	All packages in room 27 are smaller than those in room 28 2. Package A is either in room 27 or in room 28 3. Package B is in room27 4. Package B is not smaller than package A 5. Where is package A? Use resolution refutation to solve the above problem	**5**	**CO5**
5	**b**	Convert the following Statements using Propositional logic. 1) I go swimming on Mondays. 2) In order to be able to go motorcycling on Sunday, the weather must be good. 3) Eat your vegetables or you can't have dessert. 4) You can ride a bicycle only if you wear a helmet. 5) A number n that is a multiple of 2 and also multiple of 3 is a multiple of 6.	**5**	**CO5**

G. H. Raisoni College of Engineering, Nagpur

(An Autonomous Institution)

Third/ Seventh Term B.Tech. / B.E.

Computer Science Engineering/ Artificial Intelligence/ Electrical Engineering

End Semester Examination: Winter - 2021

Database Management Systems

[Time : 2 hrs.] **[Max. Marks : 50]**

Instructions:

1) All questions carry marks as indicated
2) Assume suitable data wherever necessary.
3) Due credit will be given to neatness and adequate dimensions.
4) Illustrate your answer wherever necessary with the help of neat sketches.
5) Use of non-programmable calculator is permitted.

Q. No.		Questions	Marks	COs
1	a)	Explain the need of normalization and state 3NF with example.	5	CO1
	b)	Differentiate between Network and Hierarchical model.	5	CO1
2	a)	Solve the below queries for given schema. Student (Name, Mark, Age, Place, Contact_No, DOB). i) To list name of students who do not have phone number. ii) To list students from Delhi and Bhopal. iii) To change mark of 'Ram' to 99 instead of 90. iv) List students with having alphabet 'Z' as second last letter in their name. v) To list the students whose age is more than 20.	5	CO2
	b)	Explain database trigger. How to create and delete trigger with example.	5	CO2
3	a)	Explain the concept of Serializability related to transaction processing.	5	CO3
	b)	Explain State of Transaction with diagram.	5	CO3
4	a)	Explain Data Mining. List any five features of data mining.	5	CO4
	b)	Differentiate between structured and unstructured Database on the basis of data model, storage, Analysis method, Tools and Technology.	5	CO4
5	a)	Enlist different database users & explain their role.	5	CO1
	b)	Solve the below queries for given schema Emp(empno , deptno, ename ,salary, Designation, DOB,city) i) Display employees name and number in decreasing order of salary. ii) Display total salary of each department. iii) Display the department number whose total salary is greater than 50000. iv) Display the Ename and salary of employees who earn more than Rs. 20,000 and are in deptno 10 or 50. v) Display the total number of employees whose dept.no.is '80'.	5	CO2

G. H. Raisoni College of Engineering, Nagpur

(An Autonomous Institution)

Third Term B.Tech. Artificial Intelligence

End Semester Examination: Winter - 2021

Computer Architecture and Organization

Time: 2 hrs.] **[Max. Marks: 50**

Instructions:

1) All questions carry marks as indicated
2) Assume suitable data wherever necessary.
3) Due credit will be given to neatness and adequate dimensions.
4) Illustrate your answer wherever necessary with the help of neat sketches.
5) Use of non-programmable calculator is permitted.

Q. No.		Questions	Marks	COs
Q.1	A)	What is Computer Organization? Explain the architecture structure of Computer Organization in detail.	5M	CO1
	B)	Write a short note on Bus Interconnection.	3M	CO2
	C)	Explain the functional units of computer organization in detail.	2M	CO1
Q.2	A)	Using recoded multiplier technique multiply the following: a. Multiplicand: 1 1 0 1 0 1 (-11) b. Multiplier: 0 1 1 0 1 1 (+27)	5 M	CO3
	B)	Explain Restoring division algorithm with flowchart and solve the following: a. Dividend: 11 b. Divisor: 03	5 M	CO3
Q.3	A)	Difference Between hardwired and Micro programmed Control Unit.	5M	CO4
	B)	What is Instruction set? Explain the format of Instruction set. Explain Instruction cycle state diagram in detail	5M	CO3
Q.4	A)	Define Cache Memory. A computer system uses 16-bit memory addresses. It has a 2K -byte cache organized in a direct-mapped manner with 64 bytes per cache block. Assume that the size of each memory word is 1 byte. Calculate the number of bits in each of the Tag, Block, and Word fields of the memory address.	5M	CO4
	B)	Write a note on: 1. I/O Mapped I/O 2. Memory Mapped I/O	5M	CO5
Q.5	A)	Draw neat diagram of multiple bus organization of CPU showing ALU, all types of registers and the data paths among them. Compare it with multiple bus organization of CPU.	5 M	CO6
	B)	Write control sequence for the following instruction for single bus organization: SUB (R3), R1.	5 M	CO6

UCSL201

G.H. Raisoni College of Engineering, Nagpur

(An Autonomous Institution)

Third Term B. Tech. CSE/AI/DS/EE/ETRX/ETC/IT

End Semester Examination: Winter – 2021

DATA STRUCTURES AND ALGORITHMS

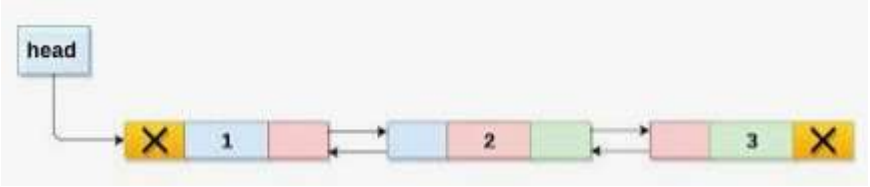
Time :2 hrs.] **[Max. Marks :50**

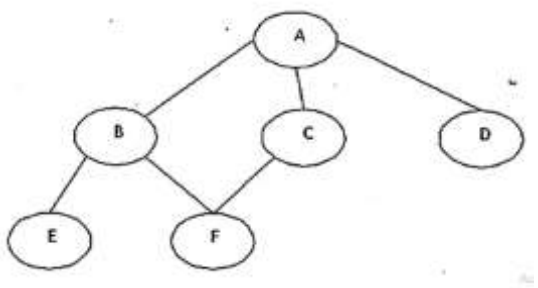
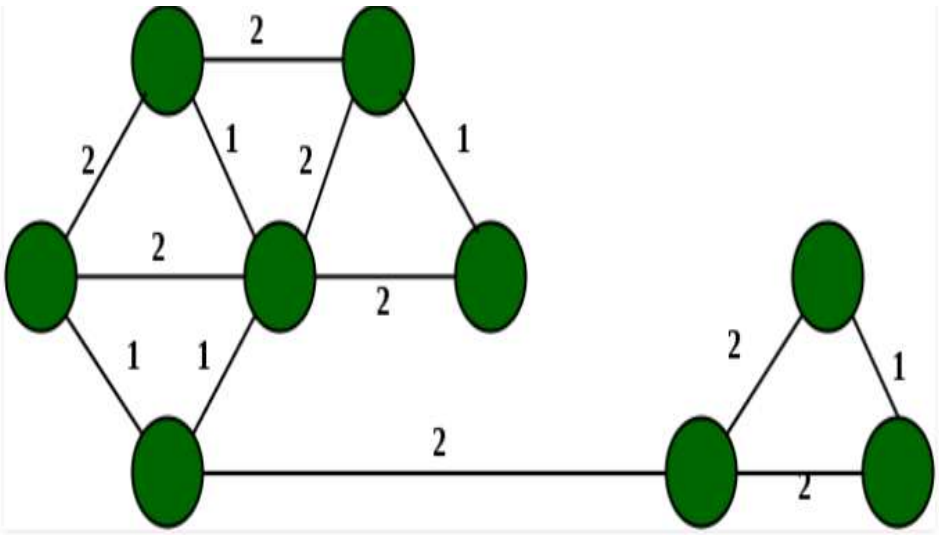
Instructions to Candidates:

1) All questions carry marks as indicated
2) Assume suitable data wherever necessary.
3) Due credit will be given to neatness and adequate dimensions.
4) Illustrate your answer wherever necessary with the help of neat sketches.
5) Use of non-programmable calculator is permitted.

Q. No.		Questions	Marks	COs
Q1	a)	Distinguish between linear and nonlinear data structures	3 M	CO1
	b)	Define Asymptotic Analysis .Derive the Big O notation for f(n)=2n+3	4 M	CO1

	c)	Find the Time Complexity for the following code:
		Fun(n)
		{
		if (n<5)
		{
		printf("%d",n)
		}
		else
		{
		for (i=0;i<n;i++)
		{
		printf("%d",i)
		}
		}
			3M	CO1

Q2	a)	Write the algorithm for implementing Towers of Hanoi using Stack	5 M	CO2
.	b)	Describe the algorithm of inserting and deleting the element in a simple queue using array. Sate the use of circular and priority queue	5 M	CO2
Q3	a)	Compare link list with array and write the algorithm to reverse the content of link list	5 M	CO3
	b)	How doubly link list solve the problem of single link list. Write an algorithm to create following double link list. 	5 M	CO3
Q4	a)	Construct Binary Search Tree for 12, 3, 4, 1, 6, 8,10,45,30,18,15	5 M	CO4

	b)	Describe the properties of B Tree. In the empty B Tree of order 3 perform following operation with stepwise illustration 1) Insert 8, 9,10,11,15,16,17,18,20,23 2) Delete 8	5M	CO4
Q5	a)	Apply BFS and DFS on below graph. Give Stepwise illustration 	5 M	CO5
	b)	Describe Spanning tree and its applications. Find the number of distinct minimum spanning trees for the weighted graph below 	5M	CO5

UCSL201

G.H. Raisoni College of Engineering, Nagpur

(An Autonomous Institution)

Third Term B. Tech. CSE/AI/DS/EE/ETC/ETRX/IT

End Semester Examination: Winter – 2021

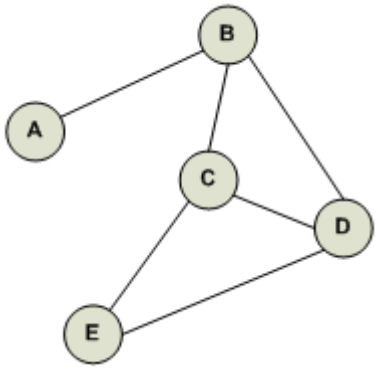
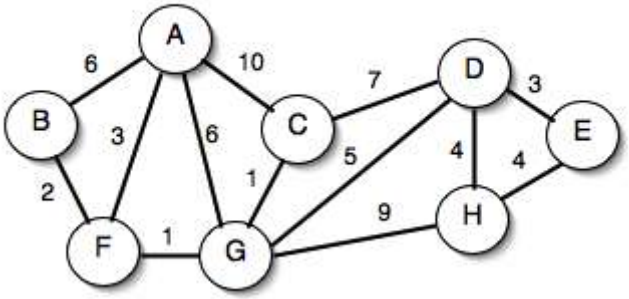
DATA STRUCTURES AND ALGORITHMS

Time :2 hrs.] **[Max. Marks : 50**

Instructions to Candidates:

1) All questions carry marks as indicated
2) Assume suitable data wherever necessary.
3) Due credit will be given to neatness and adequate dimensions.
4) Illustrate your answer wherever necessary with the help of neat sketches.
5) Use of non-programmable calculator is permitted.

Q. No.		Questions	Marks	COs
Q1	a)	Define Data Structure and Applications of Data Structures	3 M	CO1
	b)	Define Asymptotic Analysis .Derive the Big O notation for f(n)=5n+9	4 M	CO1
	c)	Find the prefix and postfix form of below infix expression A+B *(C/D) – E^ F	3M	CO1
Q2	a)	Which data structures used to perform recursion? Describe it with example.	5 M	CO2
.	b)	Describe the algorithm of inserting and deleting the element in a circular queue using array.	5 M	CO2
Q3	a)	Illustrate how Link List solve the problem of Array and write the algorithm to create following link list. 	5 M	CO3
	b)	Compare Singly and Doubly Link List. Write the algorithm to create the Doubly Link List	5 M	CO3
Q4	a)	State the application of AVL tree. Construct and describe the step by step the process of AVL tree for 7,14,2,5,10,33,56,30,15,25,66,70,4	5 M	CO4
	b)	Describe the properties of B+ Tree. In the empty B+ Tree of order 3 perform following operation with stepwise illustration 1) Insert 10,3,6,12,45,23,2,5 2) Delete 45	5M	CO4

Q5	a)	Apply BFS and DFS on below graph. Give Stepwise illustration 	5 M	CO5
	b)	Describe Spanning tree. Build a minimum spanning tree via Kruskal's algorithm 	5M	CO5

UCSL202

G. H. Raisoni College of Engineering, Nagpur

(An Autonomous Institution)

Third Term B.Tech. Computer Science & Engineering/Information Technology/Artificial Intelligence

End Semester Examination: Winter-2021

Computer Architecture and Organization

Time: 2 hrs.] **[Max. Marks: 50**

Instructions:

1) All questions carry marks as indicated
2) Assume suitable data wherever necessary.
3) Due credit will be given to neatness and adequate dimensions.
4) Illustrate your answer wherever necessary with the help of neat sketches.
5) Use of non-programmable calculator is permitted.

Q. No.		Questions	Marks	COs
Q 1	a)	Draw and explain the block diagram of a simple computer with five functional units.	5M	CO1
	b)	Explain the following addressing modes with one example each: i) Immediate ii) Register Indirect iii) Direct	3M	CO1
	c)	Elaborate the difference between RISC and CISC architecture in detail.	2M	CO1
Q 2	a)	Perform Division of following numbers using non-restoring division algorithm: a. Dividend=1011 b. Divisor=0011	5M	CO2
	b)	Represent the following numbers in single precision and double precision floating point format: a. 101.25 b. 41.625	5M	CO2
Q 3	a)	Explain the following cache mapping techniques along with their merits and demerits. i) Direct ii) Associative iii) Set Associative	5 M	CO3
	b)	Explain with example any two page replacement algorithms – FIFO, Optimal, LRU. Page address stream {2,3,2,1,5,2,4,5,3,2,5,2}, frame	5M	CO3

size 3. Identify the page faults occurred.

Q 4	a)	What are the various hazards in instruction pipelining? Explain with Example.	5M	CO4
	b)	Write a control sequence for the following instruction for single bus organization: Sub (R3), R1.	5M	CO4
Q 5	a)	**Answer the following Questions. (Solve any 1)**	5M	CO5
		i) Compare Hardwired control over micro programmed control.		
		ii) Explain in detail micro instruction sequencing organization.		
	b)	Draw neat diagram of multiple bus organization of CPU showing ALU, all types of registers and the data paths among them. Compare it with multiple bus organization of CPU.	5M	CO5

UCSL202

G.H Raisoni College of Engineering, Nagpur
(An Autonomous Institution)
Third Term/Third Semester B.Tech.
(Computer Science & Engineering/Information Technology/Artificial Intelligence)
End Semester Examination Winter-2021

Computer Architecture & Organisation

Time: 2 hrs.] **[Max.Marks:50**

Instructions
1) All questions carry marks as indicated.
2) Assume suitable data wherever necessary
3) Due credit will be given to neatness and adequate dimensions.
4) Illustrate your answer wherever necessary with the help of neat sketches.
5) Use of non-programmable calculator is permitted.

Q. No.		Questions	Marks	COs
1	a)	Write down the steps needed to execute the machine instructions Add LOC A, R0 in terms of transfer between components of processor and memory.	5	CO1
	b)	Compare basic features of RISC processor with CISC processor. Explain how RISC can achieve high speed of execution.	5	CO1
2	a)	Write down the algorithm for performing restoring division with example 11/3	5	CO2
	b)	Solve by using Bit-pair recoding 13 X -6.	5	CO2
3	a)	Why there is a need of memory hierarchy? Explain memory hierarchy.	5	CO3
	b)	Consider the following page address trace generated by cache-main memory system for n=3. Reference string = 1 6 4 5 1 4 3 2 1 2 1 4 6 7 4 1 3 1 7. Which of the page replacement policies FIFO or LRU is more suitable in this case? Justify.	5	CO3
4	a)	Explain the concept of pipeline processor. What are the advantages of pipelining?	5	CO4
	b)	Illustrate various hazards that cause performance degradation in pipelined processor.	5	CO4
5		Solve **Any Two**		
	a)	Illustrate the basic concept of hardwired control with diagram and also write difference between hardwired and micro-programmed control.	5	CO5
	b)	Explain the IEEE standard and floating point numbers with example.	5	CO3
	c)	Give the significance of addressing modes and explain different types of addressing modes.	5	CO1

UCSL206

G.H. Raisoni College of Engineering, Nagpur

(An Autonomous Institution)

Third Term B. Tech. Artificial Intelligence / Data Science

End Semester Examination: Winter – 2021

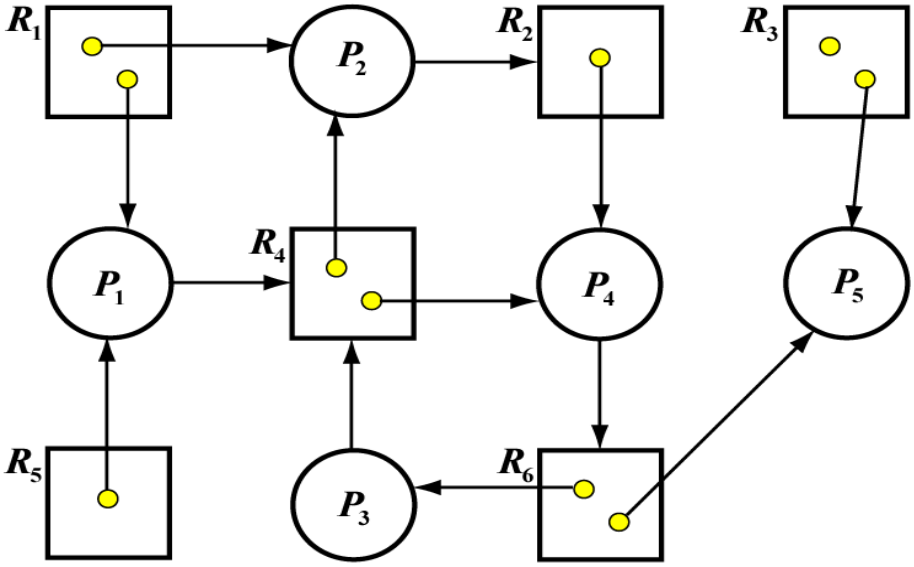
OPERATING SYSTEM

Time :2 hrs.] **[Max. Marks :50**

Instructions to Candidates:

1) All questions carry marks as indicated
2) Assume suitable data wherever necessary.
3) Due credit will be given to neatness and adequate dimensions.
4) Illustrate your answer wherever necessary with the help of neat sketches.
5) Use of non-programmable calculator is permitted.

<table>
<tr><th colspan="2">Q. No.</th><th>Questions</th><th>Marks</th><th>COs</th></tr>
<tr><td>Q1</td><td>a)</td><td>List out different services of Operating Systems and explain each service.</td><td>5 M</td><td>CO1</td></tr>
<tr><td></td><td>b)</td><td>Illustrate different types of operating system with example</td><td>5 M</td><td>CO1</td></tr>
<tr><td>Q2</td><td>a)</td><td>Consider the following set of processes, with the length of the CPU burst given in milliseconds:
<table><tr><td>Process</td><td>Burst Time</td></tr><tr><td>P1</td><td>3</td></tr><tr><td>P2</td><td>1</td></tr><tr><td>P3</td><td>5</td></tr><tr><td>P4</td><td>7</td></tr></table>The processes are assumed to have arrived in the order P1, P2, P3, P4, all at time 0.
Draw two Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: FCFS, Round Robin (quantum= 1).
What is the turnaround time and waiting time of each process for each of the scheduling algorithms?</td><td>6 M</td><td>CO2</td></tr>
<tr><td>.</td><td>b)</td><td>Differentiate between Preemptive and Non-Preemptive Scheduling</td><td>4M</td><td>CO2</td></tr>
<tr><td>Q 3</td><td>a)</td><td>What are semaphores? Explain two primitive semaphore operations. What are its advantages?</td><td>5 M</td><td>CO3</td></tr>
<tr><td></td><td>b)</td><td>What is critical section? What requirement should be satisfied for a solution to the critical section problem?</td><td>5 M</td><td>CO3</td></tr>
</table>

Q4	a)	Perform following operation for the resource allocation graph.  1) Find the Matrix for Available, Request and Allocated 2) Illustrate with details steps weather the system is in deadlock or not .If the system is in Deadlock then which processes involved in it.	5 M	CO4
	b)	Describe the methods for deadlock prevention	5M	CO4
Q5	a)	Consider the reference stream 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6. How many page faults while using FCFS and LRU using 2 frames?	5 M	CO5
	b)	Describe the tem locality of reference and elaborate on its usefulness in presenting thrashing.	5M	CO5

UAIL201

G. H. Raisoni College of Engineering, Nagpur

(An Autonomous Institution)

Third Term B.Tech. Artificial Intelligence

End Semester Examination: Winter - 2021

AI Knowledge Representation and Reasoning

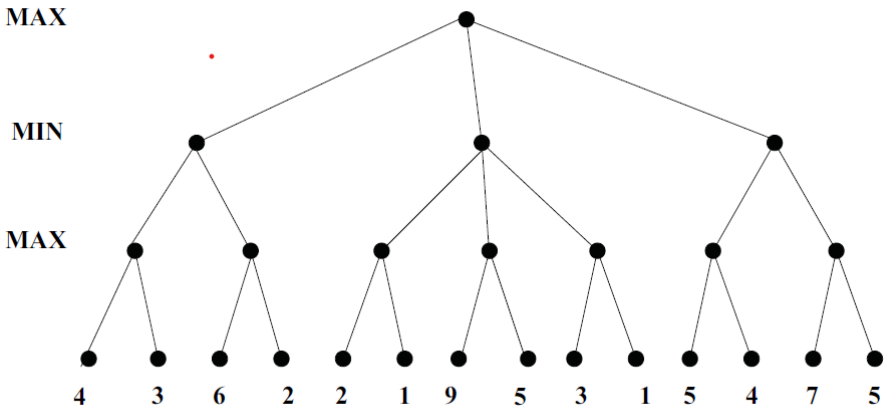
Time: 2 hrs.] **[Max. Marks: 50**

Instructions:

1) All questions carry marks as indicated
2) Assume suitable data wherever necessary.
3) Due credit will be given to neatness and adequate dimensions.
4) Illustrate your answer wherever necessary with the help of neat sketches.
5) Use of non-programmable calculator is permitted.

Q. No.		Questions	Marks	COs
1	(a)	AI agents need to work in vast range of task environments which have varied properties. Compare the contrasting properties displayed by the given task environments with help of real-world examples. Deterministic versus Stochastic environment Episodic versus Sequential environment	4	CO1
	(b)	Consider a state space where the start state is number 1 and the successor function for state **n** returns two states, number **2n** and **2n+1**. (i) Draw the portion of state space for states 1 to 15. (ii) Let the goal state be 7. List the order in which the nodes will be visited for BFS, DFS, Depth-limited Search with limit=3, and Iterative Deepening Search. (Depth=0 at start state)	6	CO1
2	(a)	Admissible heuristics can be derived from the solution cost of a subproblem of a given problem. Justify this statement taking the example of pattern databases.	5	CO5
	(b)	Define the following terms with reference to heuristic function: Admissible Consistent Prove that the A-star algorithm is optimal and complete if h(n) is both admissible and consistent. Here h(n) denotes the estimated cost of the cheapest path from node n to the goal.	5	CO5

3		Alpha-beta pruning achieves greater efficiency than minimax algorithm in adversarial search problems. Justify the statement after applying the minimax algorithm and alpha-beta pruning (left to right) on the given game tree.	10	CO2



4	**(a)**	Convert the following sentences into First Order Logic. i. If a room is breezy, some adjacent room must have a fan. ii. Every student who takes English course passes it.	4	CO3
		OR		
	(b)	Let a propositional sentence be represented by $((p \rightarrow q) \Lambda (\neg q)) \rightarrow (\neg p)$ Does the premise entail the consequent?	4	CO3
	(c)	Explain the following terms with reference to First Order Logic. Horn clause (Definite clause) Resolution rule	6	CO3
5	**(a)**	Analyze how uncertainty affects the decision-making process of an intelligent agent? How does a rational agent handle uncertain knowledge using probabilistic approach?	5	CO4
	(b)	In a bolt factory machines A, B and C manufactures respectively 25%, 35% and 40% of the total. Of their output 5%, 4% and 2% are defective bolts. A bolt is drawn from a day's production and found to be defective. What is the probability that it has manufactured by machine C?	5	CO4