1ST Semester Regular/Back Examination: 2021-22
COMPUTATIONAL METHODS AND TECHNIQUES
BRANCH(S): CIVIL ENGG., COMMUNICATION ENGG,
COMMUNICATION SYSTEMS, COMPUTER SCIENCE AND ENGG, CONSTRUCTION TECH.
AND MANAGEMENT, ELECTRICAL AND ELECTRO ENGG, ELECTRICAL ENGG.,
ELECTRO & COMM. ENGG, ELECTRO AND TELECOMMUNICATION ENGG, ENVIORN
ENGG., ENVIRONMENTAL SCIENCE AND ENGG, HEAT POWER & THERMAL ENGG,
HEAT POWER ENGG, ISE, MACHINE DESIGN, MECH. ENGG., MECH. SYSTEM DESIGN,
PLASTIC ENGG, POLYMER NANOTECH., POWER AND ENERGY ENGG, POWER
ELECTRO & DRIVES, POWER ENGG AND ENERGY SYSTEMS, POWER SYSTEM ENGG,
PRODUCTION ENGG, PRODUCTION ENGG AND OPERATIONAL MGT, SOIL MECHANICS
& FOUNDATION ENGG, STRUCTURAL & FOUNDATION ENGG, STRUCTURAL ENGG,
THERMAL & FLUID ENGG, THERMAL ENGG, VLSI & EMBEDDED SYSTEMS, VLSI &
EMBEDDED SYSTEMS DESIGN, WATER RESOURCE ENGG & MANAGEMENT
Time : 3 Hour
Max Marks : 100
Q.Code : OF584
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two
from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1		Answer the following questions:	(2×10)
	a)	What is the role of particles in PSO algorithm?	
	b)	State the factors on which optimization problems concentrates around.	
	c)	What are the factors that improves the convergence of BPN network?	
	d)	Does perception require supervised learning? Justify your answer.	
	e)	Perform the two-point crossover operation (at position 2 & 4) of the parental chromosome 011010 and 110100	
	f)	Mention the two operators largely influences the performance of the GA.	
	g)	If the overall objective function is given by $f(x) = \alpha_1 f_1(x) + \alpha_2 f_2(x)$, then how can you express about α_1 and α_2.	
	h)	State the Transitivity and De-morgan's law of fyzzy sets.	
	i)	How are neural networks modelled?	
	j)	What do you mean by fitness function in Genetic Algorithm.	

Part-II

Q2		Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)	(6 × 8)
	a)	What is the necessity of activation function? List some commonly used activation functions.	
	b)	Define membership function and its importance in fuzzy logic.	
	c)	Name and describe the main features of Genetic Algorithms (GA).	
	d)	Maximize the function $f(x) = -x^2 + 4x + 20$ subject to $-12 \leq x \leq 12$. Assume Swarm size N=10, with random initial particles.	
	e)	Write short notes on the biological inspiration behind the BFO algorithm.	

f) Mention at least 06 no of Engineering problems, where optimization can be applied to solve the engineering problems.

g) Explain the concept of Defuzzification, its use in FIS. Briefly Explain ALPHA-cut or LAMBDA-cut for Fuzzy sets.

h) Maximize the function $Y=X^2$, where the value of X ranges from 0 to 31 using the Genetic algorithm. Take the population size as 4 with length of chromosome as 5.

i) Explain how genetic algorithms work, in pseudocode also explain in brief about all the important term associated with Genetic Algorithm.

j) List the stages involved in training of back- propagation network. Draw the architecture of back-propagation algorithm

k) Give short notes on Antilock Breaking system.

l) Construction an auto associative discrete Hopfield network with input vector [1, 1, 1,-1]. Test the discrete Hopfield network with missing entries in first and second components of the stored vector.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Use any matrix iterative method to solve the following system of equations: **(16)**
$4X_1 + X_2 - X_3 = 3$;
$2X_1 + 7 X_2 + X_3 = 19$;
$X_1 - 3 X_2 +12 X_3 = 31$.

Q4 Find the weights required to perform the following classifications using perception network. The vectors (1, 1, -1, -1) and (1, -1, 1, -1) are belonging to the class (so have target value 1) vector (-1, -1, -1, 1) and (-1, -1, 1, 1) are no belonging to the class (so have target value –1). Assume learning rate 1 and initial weights as 0. **(16)**

Q5 What do you mean by BFOA, give the steps with pseudocode code for bacterial foraging algorithm of optimization techniques? Assume any suitable example. **(16)**

Q6 There are two inputs I_1 and I_2 and an output O of a process. It is required to develop a fuzzy logic controller (FLC) based on the Mamdani approach. The inputs and output are expressed using three linguistic terms namely L (low), M (medium) and H (high). The membership function distributions of the above inputs and output are shown in Fig below. The rule-base of the fuzzy logic controller is shown in Table-I below. **(16)**
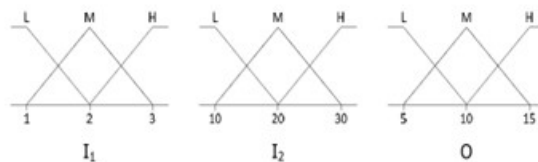

Table 1

		I_2		
		L	M	H
	L	L	L	M
I_1	M	L	M	H
	H	M	H	H

Suppose, at any instant, inputs to the fuzzy logic controller are $I_1 = 1.5$ and $I_2 = 25$.
a) Obtain the fuzzified values of the input.
b) Compute rule strengths of the rules corresponding to the given inputs.
c) Decide the fuzzy output for the given inputs.
d) Defuzzyfying the output using Center of Sum (COS) method.

1ˢᵗ Semester Regular / Back Examination : 2021-22
INTERNET OF THINGS
BRANCH(S): CIVIL ENGG., COMMUNICATION SYSTEMS,
COMPUTER SCIENCE AND ENGG, CONSTRUCTION TECH. AND MANAGEMENT, ELECTRICAL
AND ELECTRO ENGG, ELECTRICAL ENGG.,
ELECTRO & COMM. ENGG, ELECTRO AND TELECOMMUNICATION ENGG,
ENVIORN ENGG., ENVIRONMENTAL SCIENCE AND ENGG,
HEAT POWER & THERMAL ENGG, HEAT POWER ENGG,
ISE, MACHINE DESIGN, MECH. ENGG., MECH. SYSTEM DESIGN,
PLASTIC ENGG, POLYMER NANOTECH., POWER AND ENERGY ENGG, POWER ELECTRO &
DRIVES, POWER ENGG AND ENERGY SYSTEMS,
POWER SYSTEM ENGG, PRODUCTION ENGG, PRODUCTION ENGG AND
OPERATIONAL MGT, SOIL MECHANICS & FOUNDATION ENGG,
STRUCTURAL & FOUNDATION ENGG, STRUCTURAL ENGG,
THERMAL & FLUID ENGG, THERMAL ENGG, VLSI &
EMBEDDED SYSTEMS, VLSI & EMBEDDED SYSTEMS DESIGN,
WATER RESOURCE ENGG AND MANAGEMENT
Time : 3 Hour
Max Marks : 100
Q.Code : OF771

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions :** **(2×10)**

a) _____ is being used by IoT.
i) Satellite **ii)** Broadband **iii)** Radio identification technology (iv) Cable

b) What is the role of things and Internet in IoT?

c) What is the role of a coordinator in wireless sensor networks?

d) _____ is the internet protocol whose another name is WiFi.
i) 6LoWPAN **ii)** IEEE 802.11 **iii)** IEEE 802.15.4 **iv)** WiMax

e) Why is network-wide configuration important for IoT systems with multiple nodes?

f) The application of Rolls Royce jet engine sensors that monitor performance is
_____.
i) IoT **ii)** Not IoT **iii)** Wireless sensor network **iv)** Body area network

g) What do you understand by QoS in the context of wireless sensor networks?

h) _____ invented the term the "Internet of Things".
i) Steve Jobs **ii)** Kevin Ashton **iii)** Tim Berner's Lee (in) Glen Macaughty

i) In context of IoT devices, "programmability" means _____.
i) Devices can perform service discovery, network organization and resource provisioning
ii) One can use a high level language to program them into a field
iii) Device can take a variety of behaviors at a user's command without requiring physical change
iv) One can use GUI to perform them in field

j) Describe an example of an IoT system in which information and knowledge are inferred from data.

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6×8)**

a) How to use big data and visualization in IoT? How IoT is driving Big Data?
b) Mention how many frequency channels are supported in zig bee in different PHY versions.
c) Explain IEEE 802.15.4 standard.
d) Write short notes on SCADA.
e) Explain different types of sensors used in IoT applications.
f) What is business intelligence? Explain various security issues of WoT.
g) Explain the architecture standardization for WoT.
h) Mention how many frequency channels are supported in zig bee in different PHY versions.
i) Explain the following terms in the context of the identification of IoT objects and services. - Object IDs
   - Radio-frequency identification
   - Uniform resource identifier
j) What is 5-any in the context of device intelligence? What is the role of device intelligence in order to make IoT a reality? Explain.
k) Why do IoT systems have to be self-adapting and self-configuring?
l) What are the main internal components of a IoT device?

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 a) What is IoT middleware? Explain MTC/M2M middleware with a neat sketch diagram. **(8)**
b) What is the IoT framework? Discuss any one of the IoT frameworks with its features. **(8)**

Q4 Draw the layered IoT architecture and explain each layer in detail. Do we need the IP address for IoT? Why is IPv4 not suited for IoT? How devices are connected in IoT? Explain. **(16)**

Q5 a) Draw the block diagram of the RFID reader and explain its operation. **(8)**
b) Write short notes on electronic product code information services. **(8)**

Q6 a) How to connect and interface a Raspberry Pi with an Arduino? Give a detailed discussion. **(8)**
b) What are clustering principles in IoT? Explain with examples. **(8)**

1st Semester Regular / Back Examination: 2021-22
ADVANCED COMPUTER ARCHITECTURE
BRANCH(S): COMPUTER SCIENCE AND ENGG
Time : 3 Hour
Max Marks : 100
Q.Code : OF671
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1   **Answer the following questions :**   **(2×10)**
a)   Draw the basic functional units of a computer.
b)   What is the role of MAR and MDR?
c)   What is effective address and pc relative address?
d)   What are hazards in pipeline? Mention its types?
e)   What are the problems faced in superscalar architecture?
f)   What is the difference between superscalar and super pipelined approaches?
g)   Which memory architecture is scalable UMA or NUMA? Justify.
h)   How can an interleaved memory mechanism be used to improve the processing speed of a computer system?
i)   Given page reference string: 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6
Find the number of page faults for optimal page replacement algorithm
j)   What is a linear array in multiprocessor architecture?

Part-II

Q2   **Only Focused-Short Answer Type Questions- (Answer Any Eight out of**   **(6 × 8)**
Twelve)
a)   Compare CISC and RISC computer architectures.
b)   Describe Flynn's classification of computer architecture.
c)   Briefly describe the VLIW processor architecture.
What are the differences between superscalar processor and V.L.I.W. processor?
d)   Explain with the help of flow diagram how an instruction is fetched, decoded, and executed?
e)   Explain with suitable example LRU page replacement algorithm. Given page reference string: 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6
Find the number of page faults for LRU page replacement algorithm
f)   What do you mean by pipeline interlock? Explain in short basic performance issues in pipelining.
g)   Distinguish between static interconnection network and dynamic interconnection network.
h)   An 8 kB 4-way set associative write back cache is organized as multiple blocks, each of 32-byte size. Assume that the processor generates 36 bits addresses. Calculate the total size of memory required by cache controller to store the tags for cache?

i) Consider a 4-stage pipeline that consists of Instruction Fetch(IF), Instruction Decode(ID),Execute(Ex) and Write Back(WB) stages. The times taken by these stages are 50 ns,60ns,110ns and 80ns respectively. The pipeline registers are required after every pipeline stage, and each of these pipeline register consumes 10ns delay. What is the speedup of the pipeline under ideal conditions compare to the corresponding non-pipelined implementation?

j) Explain briefly about Array and Vector processors.

k) What is cache coherence problem and when do you say a memory system is coherent? What are cache coherence protocols?

l) A CPU generates 32-bit virtual addresses. The page size is 4kB.The processor has a TLB which can hold a total of 256 page table entries. The TLB is an 8-way set associative. Calculate the TLB tag size.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Explain the different classes of pipeline hazards with examples in detail. How are data hazards minimized using data forwarding in a 5-stage pipeline architecture? Explain with an Example. **(16)**

Q4 What is a cache memory? Explain the various mapping techniques of cache memory. **(16)**
A computer has an 8 GByte memory with 64 bit word sizes. Each block of memory stores 16 words. The computer has a direct-mapped cache of 128 blocks. The computer uses word level addressing. What is the address format? If we change the cache to a 4- way set associative cache, what is the new address format?

Q5 Give an overview of the taxonomy of parallel architectures. Explain in detail the symmetric shared memory architectures with reference to multiprocessor cache coherence problem. **(16)**

Q6 Explain in detail about data flow computer architecture. Distinguish between static data flow computer and dynamic data flow computer. **(16)**

Total Number of Pages : 02

M.Tech
P1CSBC04

1st Semester Regular / Back Examination: 2021-22
ADVANCED DATA STRUCTURE AND ALGORITHM
BRANCH(S): COMPUTER SCIENCE AND ENGG
Time : 3 Hour
Max Marks : 100
Q.Code : OF618
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1   **Answer the following questions :**   **(2×10)**
a) Give the properties of binomial heaps.
b) Write the Differences between spanning tree and minimum spanning tree.
c) Define B-tree?
d) Differentiate between best, average, and worst-case complexities.
e) What are the different types of Rotation in AVL Tree?
f) Define Fibonacci Heaps.
g) What is a height balanced tree? How rebalancing is done in a height balanced tree?
h) Define the single source shortest paths problem.
i) What is the difference between dynamic programming with divide and conquermethod?
j) How NP-hard problems are different from NP-Complete?

Part-II

Q2   **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**   **(6×8)**
a) What is a minimum spanning tree? Explain with an example, Krushkal's algorithm for constructing a minimum cost spanning tree.
b) Construct a heap using the following list of numbers: 12,9,8,3,7,5,10,18.
c) State and Explain Floyd-Warshall algorithm with example.
d) Construct AVL tree for the days of week on their lexicographical order. Initial order of the days is as they occur in a week from Sunday to Saturday.
e) Develop an algorithm to compute the shortest path using Dijkstra's algorithm. Validate the algorithm with a suitable example.
f) State and Explain Ukonnen's algorithm with example.
g) Construct a 2-3 tree for the list 9, 5, 8, 3, 2, 4 and by successive insertion.
h) Explain the implementation of a binomial heap and its operation with suitable example.
i) What tree is red black? What is difference between red-black and AVL tree?
j) What is Extended Euclidean Algorithm? How is Extended Euclidean Algorithm Useful?
k) Explain in detail about NP hard problems
l) Describe in detail about P and NP problems.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 State and explain the Longest Common Subsequence problem. Determine an LCS of the given two sequences < a, a, b, a, b, a, b, a > and <b, a, b, a, b, b, a, a, b> **(16)**

Q4 What is an AVL tree? Explain the need for rotation of AVL trees. Construct an AVL Tree for the list 8,9,11,6,5,7,10 by using successive insertion. Illustrate the steps clearly. **(16)**

Q5 Suppose a file to be transferred through the network contains the following characters with their number of occurrences as < a: 10, b: 25, c: 5, d: 30, e: 20 >. Determine an efficient strategy that can minimize the total cost of transferring that file of 1000 characters. Find out the total cost of transfer if transferring cost for 1-bit of data is 4 units. **(16)**

Q6 Number of items = n = 8, Knapsack Capacity = M = 17. Profit = P = {10, 15, 8, 7, 3, 15,8, 27} and weight = W = {5, 4, 3, 7, 2, 3, 2, 6}. Write a suitable algorithm to solve this problem. **(16)**

1st Semester Regular / Back Examination: 2021-22
ADVANCED OPERATING SYSTEM
BRANCH(S): COMPUTER SCIENCE AND ENGG
Time : 3 Hour
Max Marks : 100
Q.Code : OF714
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1		Answer the following questions:	(2×10)
	a)	Differentiate between single processor and multiprocessor systems.	
	b)	Briefly explain the concept of the Distributed systems?	
	c)	What is cache-coherency?	
	d)	How is logical clock calculated?	
	e)	Briefly explain how causal ordering is implemented for ordering of multicast messages?	
	f)	What are the cuts of a distribution computation?	
	g)	Write termination detection procedure in distributed system?	
	h)	Write any two limitations of centralized deadlock detection?	
	i)	Which type of network can be used by distributed system?	
	j)	Why is fault tolerance important in distributed system?	

Part-II

Q2		Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)	(6×8)
	a)	What are the elements of system architecture? Describe various types of system architecture.	
	b)	What are Lamport's logical clocks? What is the advantage of vector clock over Lamport's logical clock?	
	c)	State and explain causal ordering of message with suitable examples.	
	d)	Briefly explain various types of distributed operating system?	
	e)	State and explain four general strategies for dealing with deadlocks?	
	f)	What is Raymond's tree based algorithm? What are the variables used for each site node in Raymond tree based algorithm?	
	g)	How Suzuki Kasami's broadcast algorithm achieves mutual exclusion? What is the number of message needed in Suzuki Kasami algorithm for mutual exclusion when a site does not hold the token at the time of its request?	
	h)	Explain any one algorithm used for non-token based approach in mutual exclusion?	
	i)	What is agreement in protocol? What are the performance aspects of agreement protocol?	
	j)	How deadlock can be resolved in distributed system? Explain the algorithms used for hierarchical deadlock detection?	

k) Describe any three characteristics of distributed file systems? What are the issues in distributed file systems?

l) Explain various types of multiprocessor operating system? What are the advantages of multiprocessor operating system?

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3   Describe various issues in Distributed Operating Systems. Explain in detail about the Chandy-Lamport's Global State Recording Algorithm used in Distributed Operating Systems.   **(16)**

Q4   Why mutual exclusion is required? What is Ricart-agrawala algorithm in distributed system? How the Ricart-agrawala algorithm optimize the Lamport's algorithm?   **(16)**

Q5   Explain in detail about Deadlock Handling Strategies. Distinguish between Centralized Deadlock-Detection Algorithms and Distributed Deadlock Detection Algorithms.   **(16)**

Q6   What is distributed process scheduling? How does a distributed scheduler work? Explain in detail about shared memory in distributed computing?   **(16)**