Tribhuvan University
Institute of Science and Technology
2078
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Master Level / I Year/ 1st Semester/ Science
Computer Science and Information Technology (CSc. 543)
(Neural Networks)

Full Marks: 45
Pass Marks: 22.5
Time: 2 hours.

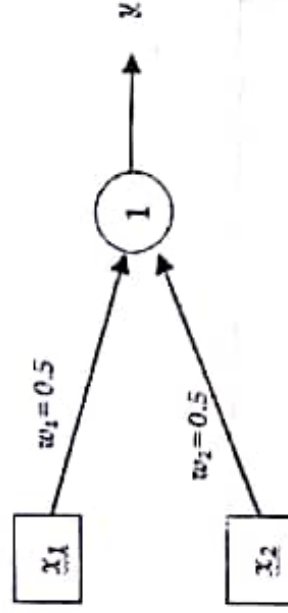*Candidates are required to give their answers in their own words as for as practicable.*
The figures in the margin indicate full marks.

<u>Group A</u>

Long answer questions:
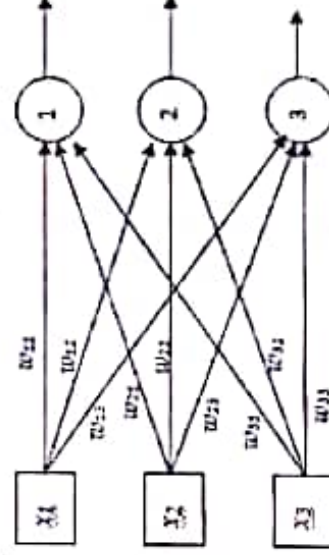**Attempt any two questions.**   (2×10=20)

1. Consider following ANN with logistic activation function. Calculate weight updates for the training sample (0.7, 0.3, 0.6) using Momentum. Assume $\alpha = 0.1$ $\beta = 0.8$.

2. Consider following 1-D SOM and initial weight matrix. Show the working of SOM for the input (0.2, 0.1, 0.3).

Initial Weight Matrix

0.1	0.2	0.3
0.2	0.4	0.5
0.3	0.6	0.4

3. Why BPTT is employed in RNNs rather than Backpropagation? Derive weight update rule for BPTT algorithm.

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Master Level / I Year/ Ist Semester/ Science
Computer Science and Information Technology (CSc. 538)
(Advanced Operating System)

Full Marks: 45
Pass Marks: 22.5
Time: 2 hours.

Candidates are required to give their answers in their own words as for as practicable.
The figures in the margin indicate full marks.

Group A

Long answer questions:

Attempt any two questions.   (2x10=20)

1. Define distributed system. Explain reasons for distributed system. Discuss the types of distributed OS.   (10)

2. Define tracks, cylinder and transfer rate. Calculate total head movement with disk queue requests for I/O to blocks of cylinders 98, 183, 37, 122, 14, 124, 65, 67, if head starts at 53 and a total of 200 cylinders from 0 to 199 using SCAN and C-SCAN scheduling methods.   (10)

3. Explain CPU scheduling algorithm optimization criteria. Find wait time, TAT, average wait time and average TAT from the given information using preemptive priority based algorithm: (10)

Process	Arrival Time (ms)	Brust Time (ms)	Priority Level
P1	0	10	1
P2	0	5	3 (Lowest)
P3	0	7	2
P4	5	6	0 (Highest)

Group B

Short answer questions:

Attempt all questions.   (5x5=25)

4. Discuss about port scanning and DOS (Denial of Service) threats.   (5)

5. Explain authentication algorithm using symmetric key distribution.   (5)

6. Explain recovery from deadlock using process termination.   (5)

7. Explain the steps used in basic page replacement.   (5)

8. Compare MPEG1, MPEG2 and MPEG4.   (5)

7. What do you mean by Numerical Differentiation? Write an algorithm for Central formula. [5]

8. Write short notes (Any Two) [2 × 2.
    a) Everett's Formula
    b) Baye's Theorem
    c) Joint Probability Distribution

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Master Level / 1 Year / 1st Semester / Science
Computer Science and Information Technology (CSc. 539)
(Object Orientation Software Engineering)

Full Marks: 45
Pass Marks: 22.5
Time: 2 hours.

Candidates are required to give their answers in their own words as for as practicable.
The figures in the margin indicate full marks.

Group A

Long answer questions:
Attempt any two questions.   (2×10=20)

1. Discuss different software life cycle models and compare among them with advantages, disadvantages and applicability.

2. Explain object-oriented software engineering with object oriented software development with practical example.

3. Explain object oriented analysis -COAD-Yourdon method and compare with traditional object oriened analysis method.

Group B

Short answer questions:
Attempt all questions.   (5×5=25)

4. Discuss the requirement model from the user requirements prospective.

5. Explain the component base software engineering in brief.

6. Explain function/data oriented method and object-oriented method.

7. Explain the software mertics with example.

8. Compare between hierarchical object-oriented design with responsibility driven design.

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Master Level / I Year/ Ist Semester/ Science
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(Object Orientation Software Engineering)

Full Marks: 45
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Group A

Long answer questions:
Attempt any two questions.   (2x10=20)

1. List several software process models. Explain how both waterfall model and prototyping model can be accommodated in the spiral process model.

2. Discuss the differences between black box and white box testing models. Discuss how these testing models may be used together to test a program schedule in object oriented testing process.

3. Differentiate between object modeling techniques with responsibility driven design with advantages and disadvantages.

Group B

Short answer questions:
Attempt all questions.   (5x5=25)

4. Differentiate between object-oriented programming with structure-oriented programming.

5. Explain the component management with practical example.

6. Explain in brief about project scheduling and tracking.

7. Discuss about object oriented testing strategies with example.

8. Write note on hierarchical object-oriented design.

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Master Level / I Year/ 1st Semester/ Science

Computer Science and Information Technology (CSc. 540)

(Algorithms and Complexity)

Full Marks: 45
Pass Marks: 22.5
Time: 2 hours.

Candidates are required to give their answers in their own words as for as practicable.
The figures in the margin indicate full marks.

Group A

Long answer questions:

Attempt any two questions.   (2×10=20)

1. Explain aggregate method of amortized analysis with reference to Hash Table.

2. Let $X_1 = 3, 6, 9, 17$ and $X_2 = 2, 5, 8, 1$. Perform odd even merge sort in a Butterfly Network.

3. Perform List ranking on the following neighbor array

5	4	2	3	0	1

Group B

Short answer questions:

Attempt all questions.   (5×5=25)

4. What do you understand by embedding of networks? Explain embedding of binary tree on Hypercube. Calculate Expansion, Dilation and Congestion.

5. Explain work optimal PRAM algorithm to solve prefix computation problem with an example.

6. Perform shear sort (sorting on Mesh) on the following

5	2	7	13
8	6	9	11
27	23	1	22
17	10	4	3

7. Explain "Reduction" with an example

8. Write Short notes
   a. Longest Forward Distance
   b. Las Vegas algorithm

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Master Level / 1 Year/ 1st Semester/ Science
Computer Science and Information Technology (CSc. 544)
(Parallel and Distributed Computing)

Full Marks: 45
Pass Marks: 22.5
Time: 2 hours.

Candidates are required to give their answers in their own words as far as practicable
The figures in the margin indicate full marks.
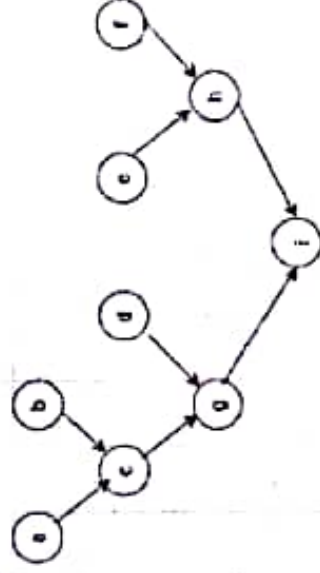
Group A

Long answer questions:

Attempt any two questions. (2×10=20)

1. Mention the semantic definition for await then rule. Describe about observation bisimilarity with an example Using the bitonic sort arrange the list {10,20,30,40,4,3,2,1} in increasing order [3 + 5 + 2]

2. What does dual nature of TM means? State the formal definition of generalized BSR model. Find the Lowest Common Ancestor in following tree graph. [2 + 2 + 6]
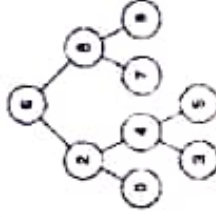
3. List any two model for communication. Find the task schedule for the following in-forest / out-forest with communication. [2 + 8]

Group B

Short answer questions:

Attempt all questions (5 × 5 = 25)

4. What is domino effect? Discuss about open distributed system. [1 + 4]

5. Apply the one criterion BSR model to solve the parenthesis matching problem for the set (())(). [5]

6. List any two basic primitives for data flow model. Describe about LogP model. [2 + 3]

7. How do you perform scheduling in partitioning and scheduling? Using PRAM model find the smallest integer in the array {5, 78, 4, 99, -7, 45, 3, 2}. [2 + 3]

8. Explain the properties of petri nets. [5]

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Group B

(5×5=25)

Short answer questions:

Attempt all questions.

4. Discuss Non-deterministic model of neuron with example.

5. Fit the quadratic curve through the following data using gradient descent. Show one epoch of training.

x	1	2	3	4
y=f(x)	1	4	4	9

6. Train perceptron up to one epoch using given training set and predict class for the input (20, High).

Hair Length	Sound Pitch	Gender (Class)
18	High	Female
24	High	Female
3	Low	Male
8	Low	Male

7. Derive formula for determining weight vector for RBFNN output layer using LMS estimation method.

8. Discuss working of linear and non-linear support vector machine classifier.

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Master Level / 1 Year/ 1st Semester/ Science

Computer Science and Information Technology (CSc. 538)
(Advanced Operating System)

Full Marks: 45
Pass Marks: 22.5
Time: 2 hours.

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.

Group A

Long answer questions:
Attempt any two questions.

(2×10=20)

1. Consider the following set of processes with the length of the CPU burst given in millisecond:

Process	Priority	Burst Time
P1	2	2
P2	1	1
P3	8	4
P4	4	2
P5	5	3

The processes are assumed to have arrived in the order of P1, P2, P3, P4, P5, all at time 0.

a) Draw the Gantt charts illustrating execution of these processes using scheduling algorithms: SJF, non – preemptive priority (a larger number implies a higher priority) and RR (quantum = 2 ms).

b) Determine TAT and waiting time of each process for each algorithm.

c) Which of the algorithm results in minimum average waiting time (over all processes)?

2. What do you mean by encryption? Explain the principle behind its different types. Show an example for asymmetric encryption algorithm.

3. Define RTS (Real Time System). Explain its various characteristics. Describe the approaches for translating addresses in RTS.

Group B

Short answer questions:
Attempt all questions.

(5×5=25)

4. What is IPC? Explain message passing and shared memory modes of IPC.

5. Explain the sequence of steps involved in handling a page fault in demand paging.

6. Define the following terms: Track, Cylinder, Seek time, Transfer Rate and Rotational Latency.

7. Explain the implementation of access matrix in the context of protection using Global Table and List of Objects.

8. Compare and contrast between stateful file system and stateless file system.

Bihu Bhattani

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Master Level / I Year/ Ist Semester/ Science
Computer Science and Information Technology (CSc. 540)
(Algorithms and Complexity)

Full Marks: 45
Pass Marks: 22.5
Time: 2 hours.

Candidates are required to give their answers in their own words as far as practicable.
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Group A

Long answer questions:
Attempt any two questions.   (2x10=20)

1. You are given an array of n positive integers (A = {$a_1, a_2, \ldots, a_n$}) which is indexed from 1 to n. A small frog sits on the first entry of the array. The frog aims to reach the last entry of the array by one or several jumps, and it has to jump according to the following rule: when the frog is on the ith entry of the array, it can only jump to the jth entry if 0 < j − i ≤ a_i,

Using dynamic programming, design an algorithm to calculate the minimum number of jumps with which the frog can reach the last entry of the array from the first entry. What is the worst case time complexity of your algorithm?   (8+2)

2. Explain Mesh algorithm for maximum selection with n^2 processor. Will it work optimal? When will it be the optimal?   (10)

3. Demonstrate odd-even merge sort in Butterfly network. Calculate its time complexity.   (7+3)

Group B

Short answer questions:
Attempt all questions.   (5X5=25)

4. Explain the randomized algorithm with reference to primality testing problem.   (5)

5. Explain how dynamic programing approach can be used to solve optimal BST.   (5)

6. How can you compute rank in a linear array? Explain.   (5)

7. Explain work done and its efficiency with a suitable example of your own for PRAM. When do you confirm that the algorithm is optimal?   (5)

8. How can you decide which algorithm design technique is suitable for given problem? Answer with reference to Tree vertex splitting, String editing, and Sum of subsets problems. (5)

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7. How do you schedule interval ordered task without communication? Illustrate with an example. (5)

8. Write short notes on (Any two) (2x2.5=5)

    a. Open Distributed System
    b. Parallel Reduction Operation
    c. PRAM Model

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(Parallel and Distributed Computing)

Full Marks: 45
Pass Marks: 22.5
Time: 2 hours.

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The figures in the margin indicate full marks.

Group A

Long answer questions:
Attempt any two questions.   (2x10=20)

1. Why do we need parallel computing? What might be the reasons behind choosing the RAM machine for modeling and characterizing parallel algorithm? Describe the models of concurrent programming.   (2 + 2 + 6)

2. State the formal definition of Generalized BSR model? List the types too. Simulate the one criterion BSR algorithm to sort the array (7,4,2,3).   (2 + 2 + 6)

3. Explain the significances of check pointing in parallel and distributed computing. Describe how check pointing with simple rollback ensure consistent check pointing.   (5 + 5)

Group B

Short answer questions:
Attempt all questions   (5 × 5 = 25)
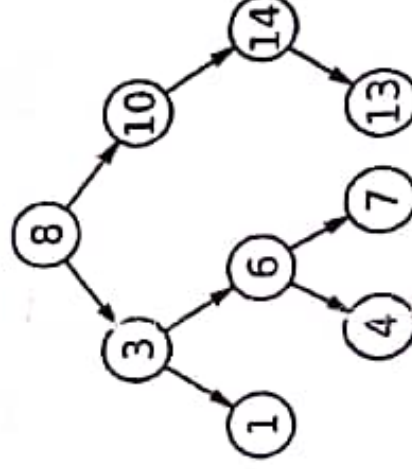
4. Define petri net. What are the purposes of colored petri net?   (3 + 2)

5. How logical clock can be used to order the events using Logical Clock in distributed computing? Explain.   (5)

6. Compute the post order numbering of the following tree.   (5)

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Bishnu Bhattorai

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Master Level / I Year/ Ist Semester/ Science
Computer Science and Information Technology (CSc. 543)
(Neural Networks)

Full Marks: 45
Pass Marks: 22.5
Time: 2 hours.

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.

Group A

Long answer questions:

Attempt any two questions.

(2x10=20)

1. What do you mean by back propagation? Write down its algorithm and explain it. How can you solve EX-OR gate problem using back propagation? Explain with suitable numerical example.

2. Differentiate between supervised and unsupervised learning. In what case we have to use semi-supervised learning. Draw the block diagram of learning framework. Explain each block with practical examples.

3. Differentiate between classical machine learning algorithm and deep learning. What do yo mean by long short term memory (LSTM). Draw its block diagram and explain it.

Group B

Short answer questions:

Attempt all questions.

(5X5=25)

4. What is a heteroassociative architecture? How can you generate weighted matrix? Explain with suitable example.

5. What is the McCulloch/Pitts Neuron? Explain it with algorithm. Why you can't apply it for the solution of EX-OR gate? Justify.

6. Explain the importance of journal papers for master's student. Explain in detail about any one paper you have studied during your course work. Explain the importance of conclusion and recommendation in the paper.

7. What do mean by fuzzy logic? Explain the importance of membership function. How can you make fuzzy system? Explain it with suitable example.

8. Explain the components of Genetic Algorithm along with its algorithm. What are the applications of Genetic Algorithm?

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