M.Sc. CSc. 538-2076 ✡

Tribhuvan University
Institute of Science and Technology
2076

✡

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 questions:

Attempt any two questions. **(2x10=20)**

1. Consider the following snapshot of a system as given bellow. Answer the following questions using Banker's algorithm:
   a. What is the content of the matrix Need?
   b. Is the system in a safe state?
   c. If a request from process P1 arrives for (0,4,2,0), can the request be granted immediately ?

	Allocation				MAX				Available			
Process	A	B	C	D	A	B	C	D	A	B	C	D
P0	0	0	1	2	0	0	1	2	1	5	2	0
P1	1	0	0	0	1	7	5	0				
P2	1	3	5	4	2	3	5	6				
P3	0	6	3	2	0	6	5	2				
P4	0	0	1	4	0	6	5	6				

2. What is Virtual Memory Management? Explain paging and segmentation in details.
3. Given a disk with 200 tracks, where track requests are received in the order 55, 58, 39, 18, 90, 160, 150, 38, 184.
   The starting position for the arm is track 100. Calculate the number of trackscrossed when the following algorithms are used
   - Shortest Seek First
   - SCAN
   - C-SCAN
   - LOOk

Group B

Short questions:

Attempt all questions **(5x5=25)**

4. Explain Earliest Deadline first scheduling algorithms with example.
5. Define system security? Explain about the Morris Internet worm.
6. What is system protection? Explain Access matrix implementation.
7. What is distributed system? Explain about cache update policy in distributed system.
8. Explain about the methods of free space management.

M.Sc. CSc. 539-2076 ✡

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Institute of Science and Technology

2076

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Master Level / I Year/ Ist Semester/ Science — Full Marks: 45

Computer Science and Information Technology (CSc. 539) — Pass Marks: 22.5

(Object Orientation Software Engineering) — 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 questions:

Attempt any two questions. **(2x10=20)**

1. Comparison between prototype model and spiral model of software development.
2. Differentiate between component base software engineering with traditional software engineering.
3. Explain object oriented analysis -COAD-Y ourdon method with example.

Group B

Short questions:

Attempt all questions. **(5x5=25)**

4. Explain about the requirement model from the user requirements prospective.
5. Why object orientation analysis is required in softqare development? Discuss.
6. Differentiate between function / data oriented method and object-oriented method.
7. Explain the classifications of real time systems with example.
8. Explain about software quality assurance.

CSc. 540-2076 ✡

Tribhuvan University

Institute of Science and Technology

2076

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Master Level / I Year/ First 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.

All questions carry equal marks.

Group A

Long questions:

Attempt any two questions. **(2x10=20)**

1. What is string editing problem? Discuss the approaches to solve this problem using greedy and dynamic approach. (3+7)

2. Differentiate between P, NP, NP-hard, NP-complete with an example of each. How can you prove that a problem is in complete? (6+4)

3. What do you understand by embedding of networks? Explain embedding of binary tree on Hypercube with example. (3+7)

Group B

Short questions:

Attempt all questions (5x5=25)

4. Compare and contrast on Monte Carlo and Las Vegas algorithms. (5)

5. 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)

6. Where do you think online Algorithms can be implemented? Explain with a suitable example. (5)

7. Explain Odd Even Merge sort in a butterfly network. (5)

8. Write short notes on: (2X2.5)
   (a)Maximum CLIQUE problem
   (b)Data concentration in Hypercube

CSC 544-2076 ✡

Tribhuvan University

Institute of Science and Technology

2076

✡

Master Level / I Year/ Ist Semester/ Science — Full Marks: 45

Computer Science and Information Technology (CSc. 544) — Pass Marks: 22.5

(Parallel and Distributed Computing) — 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 questions:

Attempt any two questions. (2x10=20)

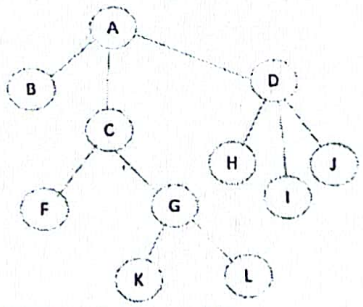
1. When a program is said to be partial and total correct? List the difference and similarities between process algebra and process graph. Describe the properties of petri net. (2 + 2 + 6)
2. Explain the components of scheduling system model. (10)
3. List the types of PAM model. Illustrate the BSR algorithm to find the maximal sum sub segment for the array {23, -9 ,44, 3, 5, -1, 67}. (2 + 8)

Group B

Short questions:

Attempt all questions. (5x5=25)

4. Find the number of descendants in the following tree graph. (5)



5. Describe the basic primitives of the data flow models. (5)
6. Differentiate between Bully algorithm and Ring algorithm. (5)
7. How sequence statement and loop are defined using axiomatic semantic definition? Explain. (5)
8. Write short notes on (Any two) (2x2.5)

a. Operation swap all

b. Engineering model in open distributed system

c. Byzantine failure

CSC 545-2076 ✡

Tribhuvan University
Institute of Science and Technology
2076
✡

Master Level / I Year/ Ist Semester/ Science
Computer Science and Information Technology (CSc. 545)
(Algorithmic Mathematics)

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

1. Derive Newton Raphson method to solve non linear equation. Write an algorithm to find the roots of non linear equation using Newton Raphson method and Trace the algorithms with one suitable example.

2. What do you mean by numerical differentiation? Write an algorithm for central difference quotient formula with example.

3. What is joint probability distribution? Explain Poisson's distribution with suitable example. Write down its algorithm.

Group B

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

4. What are uses of Newton interpolation? Write down its equation, algorithm and explain it.
5. Explain Fast Fourier Transformation with suitable example.
6. What do you mean by optimization? Explain application of Integer Programming.
7. What do you mean by Extrapolation? Write an algorithm for polynomial regression with example.
8. Write short notes (Any Two) (2x2.5=5)

   a) Bessel's Formula,
   b) Predictor-Corrector Methods,
   c) Eigen value Problem

CSc. 538-20734 ✡

Tribhuvan University
Institute of Science and Technology
2074
✡

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 questions:

Attempt any two questions. **(2x10=20)**

1. A page-replacement algorithm should minimize the number of page faults. You can achieve this minimization by distributing heavily used pages evenly over all of memory, rather than having them compete for a small number of page frames. You can associate with each page frame a counter of the number of pages associated with that frame. Then, to replace a page, we can search for the page frame with the smallest counter.
   a) Define a page-replacement algorithm using this basic idea. Specifically address these problems:
      i. What is the initial value of the counters?
      ii. When are counters increased?
      iii. When are counters decreased?
      iv. How is the page to be replaced selected?

   b) How many page faults occur for your algorithm for the following reference string with four page frames and compare it with optimal page replacement strategy?
      1, 2, 3, 4, 5, 3, 4, 1, 6, 7, 8, 7, 8, 9, 7, 8, 9, 5, 4, 5, 4, 2.

2. Explain the multimedia disk scheduling algorithms with an example.

3. Discuss real time system. Explain the Real time CPU scheduling algorithms.

Group B

Short questions:

Attempt all questions. **(5x5=25)**

4. Explain the feature of real time kernel.

5. What are threads? How threads are differ from processes? Discuss how thread improve the system performance?

6. What is system protection? Explain the protection domain?

7. What is Distributed file system? Explain the issues of distributed file system.

8. Explain the Rate Monotonic Real Time Scheduling with an example.

Tribhuvan University
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2074
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Master Level / I Year/ Ist 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 questions:

Attempt any two questions. **(2x10=20)**

1. Differentiate between object-oriented software engineering and object oriented software development.
2. Explain about object-oriented system design and object-oriented program design.
3. Explain with example of different steps to develop the requirement model from the user requirements.

Group B

Short questions:

Attempt all questions. **(5x5=25)**

4. Differentiate function/data oriented method with object-oriented method.
5. Explain the component management with example.
6. Explain about real time classification of real time systems.
7. What is the process of project selection and preparation of object oriented software development? Explain.
8. Explain about responsibility-driven design (RDD)? Explain.

Tribhuvan University
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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 for as practicable.
The figures in the margin indicate full marks.

Group A

Long questions:

Attempt any two questions. **(2x10=20)**

1. Explain accounting method of amortized analysis with a suitable example.
2. Compare Greedy method and Backtracking method of algorithm design with example.
3. Compare and contrast different strategies that can be implemented in ONLINE algorithms.

Group B

Short questions:

Attempt all questions. **(5x5=25)**

4. Illustrate Job sequencing with deadlines by providing example.
5. Explain prefix computation of Mesh model.
6. Define speed up, asymptotic speed up, total work done and efficiency of PRAM algorithm.
7. How can you implement randomized algorithm in identifying repeated elements.
8. Explain an algorithm for data concentration problem on linear array with example.

CSc. 544-2074 ✡

Tribhuvan University
Institute of Science and Technology
2074
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Master Level / I Year/ Ist Semester/ Science
Computer Science and Information Technology (CSc. 544)
(Parallel and Distributed Computing)

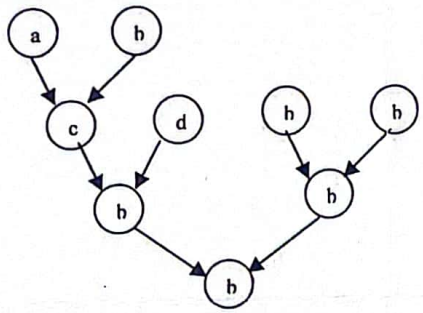
Full Marks: 45
Pass Marks: 22.5
Time: 2 hours.

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

Group A

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

1. Discuss about the measurements used for performance evaluation of PDC system. Draw the Gantt chart to schedule the following task graph with communication with two processors. Assume the communication time is one unit. (4+6)



2. Show the relationship between process algebra and Petri nets with suitable example. Explain the properties of Petri nets. (5+5)

3. "The study of programming language semantics deals with assigning meanings to program." Justify the sentence. Explain the attributes of concurrency model of concurrent programming. (4+6)

Group B

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

4. Define Alternating Turing Machine. Mention the reasons in brief that why Turing machine serves as a very good basic machine. (1+4)

5. What is the purpose behind scheduling the events? Define the processes Broadcasting, Selection and Reduction. (2+3)

6. Why are randomized algorithms important in computing? Explain with a suitable example. Sort the sequence {3, 5, 8, 9, 7, 4, 2, 1} using bitonic sort. (5)

7. "Problem arises sin distributed systems when processors need to share resources". Justify this sentence. Explain any two types of failures that may occur in this system. (2+3)

8. Write short notes on (**Any two**): (2.5+2.5)
   a) Ricart Agrawala Algorithm
   b) Vector Clock
   c) NC - Class

CSc. 545-2074 ✡

Tribhuvan University
Institute of Science and Technology
2074

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Master Level / I Year/ Ist Semester/ Science
Computer Science and Information Technology (CSc. 545)
(Algorithmic Mathematics)

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 questions:

Attempt any two questions. **(2x10=20)**

1. Derive the equation for the solution of system of non linear equations using Newton Raphson Method. Write its algorithm and explain the steps.

2. Derive the formula for Newton's Backward Interpolation and write its algorithm. Compare it with Newton's Forward Interpolation Formula. Explain the importance of interpolation in the practical life.

3. Explain binomial distribution with suitable example and write down its algorithm. Explain the importance of distribution in the computer science.

Group B

Short questions:

Attempt all questions. **(5x5=25)**

4. Derive the equation for quadratic curve fitting. Write down its algorithm and explain it.

5. Derive the equation for Jordan method, explain it with suitable example and, write its algorithm.

6. How can you solve ordinary differential equation using Euler's method? Write down its algorithm.

7. What are the steps used in the optimization techniques? Explain the graphical method for solving linear programming with simple example.

8. Why we require Laplace Transform? Explain with suitable example.

1CSc. 538-2073 ✡

Tribhuvan University
Institute of Science and Technology
2073
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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 questions:

Attempt any two questions. **(2x10=20)**

1. What is real time System? Compare the Rate Monotonic and Earliest deadline first real time CPU scheduling with example.

2. What is system security? Explain the common program threats. Put your view on best way of protecting the system form such threats.

3. Discuss multimedia disk scheduling algorithms with example.

Group B

Short questions:

Attempt all questions. **(5x5=25)**

4. What are the requirement of multimedia kernel? Explain.

5. Define semaphore? Explore the use of semaphore in system design.

6. Explain the Log Structured File Systems.

7. Five batch jobs A through E, arrive at a computer center at almost the same time. They have estimated running times of 10, 6, 2, 4 and 8 minutes. Their priorities are 3, 5, 2, 1, and 4, respectively, with 5 being the highest priority. For each of the following scheduling algorithms, determine the mean processes turnaround time. Ignore processes switching overhead.
   a. RR (with quantum = 2 min)
   b. Priority scheduling
   c. FCFS (run in order 10, 6, 2, 4, 8)
   d. SJF

   For (a), assume that the system is multiprogrammed, and that each job gets its fair share of CPU. For (b) through (d) assume that only one job at a time runs, until it finishes. All jobs completely CPU-bound.

8. What is access-matrix? Describe the use of access matrix with example.

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Master Level / I Year/ Ist 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 questions:

Attempt any two questions. **(2x10=20)**

1. Differentiate between object Modeling technique (OMT) and responsibility driven design (RDD).

2. Explain the function/data oriented method with object-oriented method with example.

3. What is object oriented analysis -COAD-Yourdon method? Explain with example.

Group B

Short questions:

Attempt all questions. **(5x5=25)**

4. Differentiate between object modeling technique (OMT) and responsibility driver design (RDD)

5. What are the different steps to develop the requirement model from the user requirements? Explain with example.

6. What is a component? Explain the component management with example.

7. Explain the project selection and preparation of object oriented software development.

8. Explain the software metrics with example.

1CSc. 540-2073 ✡

Tribhuvan University
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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 for as practicable.
The figures in the margin indicate full marks.

Group A

Long questions:

Attempt any two questions. **(2x10=20)**

1. Explain potential method of amortized analysis with a suitable example.
2. What is the use of Backtracking? Highlight on the issues related with knapsack problem.
3. Where can the concept of binary tree be implemented? What is prefix computation? Explain.

Group B

Short questions:

Attempt all questions. **(5x5=25)**

4. Justify the applicability of randomized algorithm with suitable example.
5. State and give an online algorithm to solve ski rental problem.
6. Explain the process of embedding of binary tree with hypercube.
7. Differentiate between P, NP and NP hard problem with necessary examples.
8. Where can the concept of Min-Max Tree be implemented? Justify your answer with real life application.

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Master Level / I Year/ Ist 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 for as practicable.
The figures in the margin indicate full marks.

Group A

Long questions:

Attempt any two questions. **(2x10=20)**

1. "Program dependency effect the task scheduling". Justify this sentence. Trace the one criterion BSR algorithm for finding the maximal sum subsegment from the following array.

31	-41	59	26	-53	58	97	-93	-23	84

(4+6)

2. List the advantages of concurrent programming over sequential programming. Explain about semantics behind axiomatic, operational and denotational semantics with examples. (3+7)

3. Show the relationship between process algebra and Petri nets with suitable example. Explain the properties of Petri nets. (5+5)

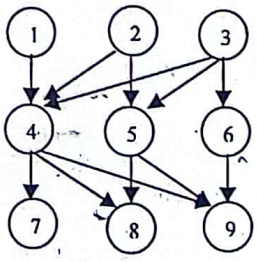
Group B

Short questions:

Attempt all questions. **(5x5=25)**

4. Draw a Petri net showing the data flow computation of $x = \frac{a+b}{a-b}$. (5)

5. Does task supplication reduces the effect of communication delay? Explain. Draw the Gantt chart to schedule the following interval ordered task without communication. (2+3)



6. Why are randomized algorithms important in computing? Explain with a suitable example. Sort the sequence {3, 5, 8, 9, 7, 4, 2, 1} using bitonic sort. (5)

7. "Problem arises sin distributed systems when processors need to share resources". Justify this sentence. Explain any two types of failures that may occur in this system. (2+3)

8. Write short notes on (**Any two**): (2.5+2.5)
   a) Ricart Agrawala Algorithm
   b) Physical Clock
   c) Check pointing using task duplication

1CSc. 545-2073 ✡

Tribhuvan University
Institute of Science and Technology
2073
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Master Level / I Year/ Ist Semester/ Science
Computer Science and Information Technology (CSc. 545)
(Algorithmic Mathematics)

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 questions:

Attempt any two questions. **(2x10=20)**

1. Derive the basic mathematical equation for the solution of nonlinear equation using Newton Raphson method. Write its algorithm and explain the steps. Explain where nonlinear equations are required in practical life.

2. What do you mean by Runge-Kutta method? Derive the basic equation for second order Runge-Kutta method and write down its algorithm.

3. Why statistics is required in the computer science? Explain. Also explain the relationship of measure of central tendency, dispersion, and direction with suitable examples.

Group B

Short questions:

Attempt all questions. **(5x5=25)**

4. Derive the formula for Newton's forward interpolation formula and write its algorithm.

5. Derive the equation for least square method and write down its algorithm.

6. Derive the equation for power method and write its algorithm. Explain the practical meaning of Eigen value.

7. Why do you require optimization? Explain the applications of integer linear programming with practical example.

8. Why we require Discrete Fourier Transform? Explain with suitable example.

Tribhuvan University
Institute of Science and Technology
2072

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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 questions:

Attempt any two questions. **(2x10=20)**

1. Explain the Weighted Round Robin CPU scheduling algorithm with suitable example.
2. What is real time System? Explain the Real time CPU scheduling algorithms.
3. Explain the multimedia disk scheduling algorithms with an example.

Group B

Short questions:

Attempt all questions. **(5x5=25)**

4. Explain the basic characteristic of multimedia system.
5. What are the advantages of the variant of linked allocation that uses a FAT to chain together the blocks of a file?
6. Can strict alternation solution preserve all conditions of critical region problem? If yes, explain how. If not, mention which conditions it violates and how?
7. What is distributed operating system? Compare Caching and Remote Service.
8. Explain how firewalling protect systems and networks.

Tribhuvan University
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Master Level / I Year/ Ist 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 questions:

Attempt any two questions. **(2x10=20)**

1. Explain the Object Orientation Development process and object oriented analysis with example.
2. Explain the Hierarchical object oriented design (HOOD) with example.
3. Explain the object oriented design-Booch method with example.

Group B

Short questions:

Attempt all questions. **(5x5=25)**

4. What is requirement model? Explain with practical example.
5. Differentiate between function/data oriented method and object-oriented method.
6. Explain the classification of real time systems with example.
7. Explain the key factors involve in managing the object-oriented software engineering.
8. What do you mean by software quality assurance? Explain.

1CSc. 540-2072 ✡

Tribhuvan University
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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 for as practicable.
The figures in the margin indicate full marks.

Group A

Long questions:

Attempt any two questions. **(2x10=20)**

1. Explain aggregate method of amortized analysis with a suitable example.
2. Compare Divide-Conquer and Dynamic programming approaches of algorithm design with example.
3. Differentiate between P, NP, NP-hard and NP-complete with an example of each.

Group B

Short questions:

Attempt all questions. **(5x5=25)**

4. Explain the process of creating a Butterfly network.
5. What are the advantages and disadvantages of online algorithm?
6. Briefly explain the Broadcasting problem for Mesh.
7. Prove that satisfiability of Boolean formula (SAT) is NP-complete.
8. What is Vertex cover problem? Illustrate its use with suitable example.

1CSc. 544-2072 ✡

Tribhuvan University
Institute of Science and Technology
2072

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Master Level / I Year/ Ist 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 for as practicable.
The figures in the margin indicate full marks.

Group A

Long questions:

Attempt any two questions. **(2x10=20)**

1. Why do computing need parallel computing paradigms? Give the Von Neumann Computer architecture. Explain about different classes for parallel processing paradigms.

2. "The study of programming language semantics deals with assigning meanings to program". Justify this sentence. Explain the attributes of concurrency model of concurrent programming.

3. List the advantages of concurrent programming over sequential programming. Explain about semantics behind axiomatic, operational and denotational semantics with examples.

Group B

Short questions:

Attempt all questions. **(5x5=25)**

4. Why and when do we need leader election in distributed computing? Explain Ring algorithm for leader election.

5. Define process algebra. Differentiate between data driven and demand driven computing models.

6. Trace the one criterion BSR algorithm for parenthesis matching for the input sequence ()((()))(()).

7. Discuss the significance on partitioning and scheduling the task? Explain any one technique for consistent checkpointing.

8. Write short notes on (**Any two**):
   a) CU/PE Overlap
   b) Logical Clock
   c) Clock Synchronization

Tribhuvan University
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Master Level / I Year/ Ist Semester/ Science
Computer Science and Information Technology (CSc. 545)
(Algorithmic Mathematics)

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 questions:

Attempt any two questions. **(2x10=20)**

1. How can you solve the system of nonlinear equations? What is the role of Jacobian matrix? Write down its algorithm and explain the steps.

2. Why numerical integration is required? Explain it with suitable example. Derive the general quadrature formula. Write down its algorithm and explain it.

3. Why distribution is important in the probability? Explain Poisson's distribution with suitable example and write down its algorithm.

Group B

Short questions:

Attempt all questions. **(5x5=25)**

4. Explain the use of Lagrangian interpolation. Write down its equation, algorithm and explain it.

5. Differentiate between direct and iterative method for the solution of linear system of equations. Write down the algorithm for Gauss Seidal method.

6. Write down the general form of second order partial differential equation and explain it. Differentiate between Laplacian and Poisson's equation.

7. Explain the applications of dynamic programming with practical example. Explain the practical application of optimization techniques.

8. Why we require Fast Fourier Transform? Explain with suitable example.

1CSc. 532-2070✡

Tribhuvan University
Institute of Science and Technology
2070

✡

Master Level / I Year/ Ist Semester/ Science
Computer Science and Information Technology (CSc. 532)
(Object Oriented Software Engineering)

Full Marks: 60
Pass Marks: 30
Time: 3 hours.

Candidates are required to give their answers in their own words as for as practicable.
All questions carry equal marks.

Attempt all questions.

1. Explain object-oriented software engineering and object oriented software development.

2. Explain the object oriented system development with function/data methods with example.

3. What is done in analysis? Explain the requirement model with example.

4. What are the key factors involved in managing the object-oriented software engineering? Explain with example.

5. Explain the object oriented design (OOD/Booch) with its architecture, method and deliverables.

6. Explain the design steps in Hierarchical Object-oriented design (HOOD) with example.

1CSc. 533-2070✡

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Master Level / I Year/ Ist Semester/ Science
Computer Science and Information Technology (CSc. 533)
(Algorithms and Complexity)

Full Marks: 60
Pass Marks: 30
Time: 3 hours.

Candidates are required to give their answers in their own words as for as practicable.
All questions carry equal marks.

Attempt all questions.

1. Explain with example of the potential and aggregate methods of amortized analysis.
2. Find the minimum edit distance to transform the String X=aabab into Y=babb using dynamic programming approach.
3. What do you mean by randomized algorithms? Explain with examples.
4. State and prove Cook's theorems.
5. Design and analyze approximation algorithm to solve "Vertex Cover Problem".
6. Compare online algorithm with offline algorithm. State and give an online algorithm to solve Ski rental problem.
7. Explain an algorithm for data concentration problem on linear array with example.
8. Explain the PRAM algorithm to merge two sorted list with example.
9. Discuss the feature of hypercube and explain the process of Embedding of binary tree with hypercube.
10. Design an algorithm to solve prefix computation problem on Hypercube.

1CSc. 536-2070✡

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Master Level / I Year/ Ist Semester/ Science
Computer Science and Information Technology (CSc. 536)
(Algorithmic Mathematics)

Full Marks: 60
Pass Marks: 30
Time: 3 hours.

Candidates are required to give their answers in their own words as for as practicable.
The questions are of equal value.

Attempt all questions.

1. How can you solve the system of nonlinear equations? Explain the importance of Jacobian Matrix. Write down its algorithm and explain the steps.

2. If the data is not evenly spaced, which interpolation method you apply? Explain it with suitable example and algorithm.

3. What are the main advantages of Least Square Method? Derive the equation for quadratic curve fitting. Write down its algorithm and explain it.

4. Why Numerical Integration is required? Explain it with suitable example. Derive the general quadrature formula. Write down its algorithm and explain it.

5. Differentiate between direct and iterative method for the solution of linear system of equations. Derive the equation for Gauss Seidal method, explain it with suitable example and, write its algorithm.

6. Write down the general form of second order partial differential equation and derive the Poisson's equation. Explain the equation and write down its algorithm.

7. Justify that Measure of Central Tendency, Dispersion, and Direction are important in the statistics. Explain with suitable equations and examples.

8. Why distribution is important in the probability? Explain Poisson's distribution with suitable example and write down its algorithm.

9. Why do you require optimization? Explain the steps for Simplex Method with suitable example and write its algorithm. Compare it with Dynamic Programming.

10. Why we require Discrete Fourier Transform? Explain with suitable example. Compare it's with Fast Fourier Transform and writes its algorithm.

1CSc. 532-2071 ✡

Tribhuvan University
Institute of Science and Technology
2071
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Master Level / I Year/ Ist Semester/ Science
Computer Science and Information Technology (CSc. 532)
(Object Oriented Software Engineering)

Full Marks: 60
Pass Marks: 30
Time: 3 hours.

Candidates are required to give their answers in their own words as for as practicable.
All questions carry equal marks.

Attempt all questions.

1. Explain object-oriented software development with example.

2. Explain the function/data methods in object-oriented system development with example.

3. Differentiate between model architecture and requirement model.

4. What are the three main reasons in construction phase? What is done in the construction phase? Explain.

5. Explain the managing the object-oriented software engineering with practical example.

6. Explain the object modeling technique (OMT) with its architecture, method and deliverables.

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Master Level / I Year/ Ist Semester/ Science
Computer Science and Information Technology (CSc. 533)
(Algorithms and Complexity)

Full Marks: 60
Pass Marks: 30
Time: 3 hours.

Candidates are required to give their answers in their own words as for as practicable.
All questions carry equal marks.

Attempt all questions.

1. Compare Divide-Conquer and Dynamic programming approaches of algorithm design with example.

2. State the 0/1 knapsack problem. Suppose $n = 4$, $W = 16$, and we have the following:

i	p_i	w_i	p_i/w_i
1	\$40	2	\$20
2	\$30	5	\$6
3	\$50	10	\$5
4	\$10	5	\$2

Find the maximum profit using backtracking technique.

3. Prove that satisfiability of Boolean formula (Formula SAT) is NP-complete (NPC).

4. Design and analyze approximation algorithms for Vertex Cover Problem.

5. Compare online algorithm with offline algorithm. Explain an online algorithm for page replacement policy with example.

6. Define **speed up, asymptotic speed up, total workdone and efficiency** of PRAM algorithms with an illustrative example.

7. Explain the Work optimal PRAM algorithm to solve Prefix computation problem with example.

8. Explain the Broadcasting problem for Mesh with example.

9. Explain about hypercube. Discuss the process of drawing butterfly network.

10. Design an algorithm to solve broadcasting problem on Hypercube.

M.Sc. CSc. 545-2075 ✡

Tribhuvan University
Institute of Science and Technology
2075
✡

Master Level / I Year/ Ist Semester/ Science
Computer Science and Information Technology (CSc. 545)
(Algorithmic Mathematics)

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 questions:

Attempt any two questions. **(2x10=20)**

1. Derive Secant method to solve non linear equation. Write an algorithm to find the roots of non linear equation using Newton Raphson method and Trace the algorithm with one suitable example.

2. What do you mean by numerical integration? Derive general quadrature formula. Write an algorithm for Gaussian Integration with example.

3. What is conditional probability? Explain Poisson's distribution with suitable example. Write down its algorithm.

Group B

Short questions:

Attempt all questions. **(5x5=25)**

4. What are uses of Newton interpolation? Write down its equation, algorithm and explain it.

5. Explain Fast Fourier Transformation with suitable example.

6. What do you mean by Optimization? Explain application of Integer Programming.

7. Compare and contrast t-Test and z-Test.

8. Write short notes (**Any Two**): [2×2.5=5]
   a) Bessel's Formula
   b) Predictor -Corrector Methods
   c) Eigen value Problem

M.Sc. CSc. 540-2075 ✡

Tribhuvan University
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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 for as practicable.
The figures in the margin indicate full marks.

Group A

Long questions:

Attempt any two questions. **(2x10=20)**

1. What are probabilistic and randomized algorithms? Compare and contrast on Monte Carlo and Las Vegas algorithm.

2. Demonstrate odd-even merge sort in Butterfly network. Calculate its time complexity.

3. Explain Mesh algorithm for maximum selection with n processor. Will it work optimal? When will it be the optimal?

Group B

Short questions:

Attempt all questions. **(5x5=25)**

4. Explain how dynamic programing approach can be used to solve Optimal BST.

5. State cook's theorem. Discuss the cook's method to show SAT is NP had and happens to be NP-Complete.

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

7. How can you compute Rank in a linear Array? Explain.

8. Write short notes on:
   a) Subset Sum problem
   b) Prefix computation in Mesh

M.Sc. CSc. 539-2075 ✡

Tribhuvan University
Institute of Science and Technology
2075
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Master Level / I Year/ Ist 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 questions:

Attempt any two questions. **(2x10=20)**

1. Explain with example software process model and a software process.
2. Differentiate between object modeling technique (OMT) and responsibility-driven design (RDD).
3. Explain the Hierarchical object oriented design (HOOD) with example.

Group B

Short questions:

Attempt all questions. **(5x5=25)**

4. Explain the key steps to develop the requirement model from the user requirements.
5. What is Object Orientation analysis? Explain with example.
6. Why software metrics in important in software development? Explain with example.
7. Explain the classifications of real time systems? Explain.
8. Comparisons between components and components management.

M.Sc. CSc. 538-2075 ✡

Tribhuvan University
Institute of Science and Technology
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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 questions:

Attempt any two questions. **(2x10=20)**

1. Explain the four necessary conditions for deadlock. How banker's algorithms avoid the deadlock? Explain with example.

2. 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. How many page faults would occur for the following algorithms:
   a. LRU replacement,
   b. Clock replacement,
   c. Optimal replacement algorithms?

   Assuming three and five frames. Remember all frames are initially empty, so your first unique pages will all cost one fault each.

3. What are the challenges of Multimedia operating system? Explain JPEG Compression method.

Group B

Short questions:

Attempt all questions. **(5x5=25)**

4. A system has two process & three resources. Each process needs a maximum of two resources, is deadlock possible? Explain the answer.

5. What is critical section problem? Why executing critical section must be exclusive? Explain.

6. A certain computer provides its users with a virtual-memory space of 232 bytes. The computer has 218 bytes of physical memory. The virtual memory is implemented by paging, and the page size is 4096 bytes. Explain how the system establishes the corresponding physical address.

7. On a system with paging, a process cannot access memory that it does not own; why? How could the operating system allow access to other memory?

8. What is real time system? Explain earliest deadline first scheduling.

M.Sc. CSc. 544-2075 ✡

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Institute of Science and Technology
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Master Level / I Year/ Ist 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 for as practicable.
The figures in the margin indicate full marks.

Group A

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

1. List the parallel processing paradigms. Illustrate the one criterion BSR algorithm to find the maximal sum sub segment in the following array. [2 + 8]

   {43, -3, 76, 45, 32, 34, -6, 78, 55, 34}

2. Describe the models of concurrent programming. Explain the properties of Petri net with examples. [4 + 6]

3. How multiple reductions are performed in a single set of data? Explain with example. Find the smallest value in the set of N values using parallel algorithm. Also mention the procedure to choose the processor. [5 + 5]

Group B

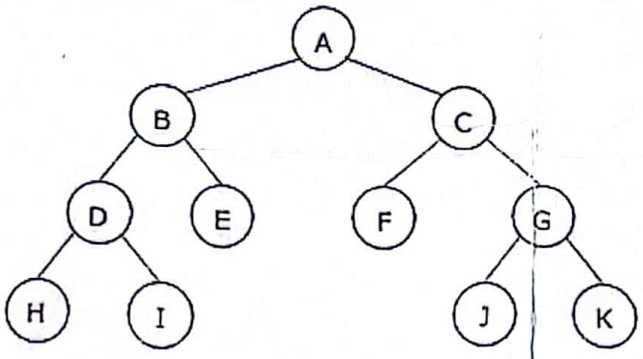
Short questions:
Attempt all questions. **(5x5=25)**

4. Differentiate between logical clock and vector clock. Give the rules for vector clock. [2 + 3]

5. Give any two basic primitives of data flow model. How interval ordered tasks are scheduled without communication? Describe with suitable example. [1 + 4]

6. What are the basic terms of complexity theory? Why Turing Machine is considered as the basis of consequences. [1 + 4]

7. Compute the post order numbering of following tree using tree algorithm. [5]



8. Write short notes on **(Any TWO)** [2×2.5 = 5]
   a. Target Machine
   b. Checkpoint with Rollback
   c. Process Algebra

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Master Level / I Year/ Ist Semester/ Science
Computer Science and Information Technology (CSc. 535)
(Parallel and Distributed Computing)

Full Marks: 60
Pass Marks: 30
Time: 3 hours.

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

Attempt all questions.

1. Discuss the Von Neumann approach for computer. Explain the purpose of Petri net with suitable example. (3+3)

2. Describe about operational semantics. Draw a Petri net showing the data flow computation of $x = \frac{a+b}{a-b}$. (4+2)

3. Define NP – Complete problem. Explain about satisfiability problem with suitable example. (2+4)

4. "Problem arises in distributed systems when processors need to share resources". Justify this sentence. Explain any two types of failures that may occur in this system. (2+4)

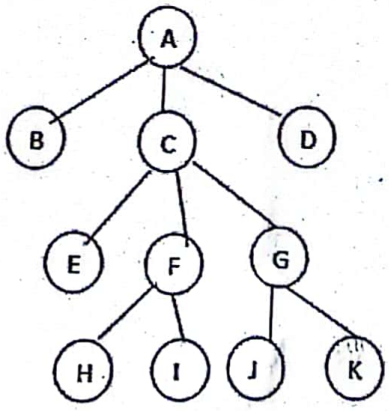
5. Explain in brief about the classes of PRAM according to restrictions on shared memory. Discuss about List ranking PRAM algorithm. (3+3)

6. Trace the one criterion BSR algorithm for finding the maximal sum subsegment from the following array. (6)

31	-41	59	26	-53	58	97	-93	-23	84

7. What are the four components that a scheduling system model consists of? Explain each of them. (6)

8. Find the list of lowest common ancestors from the following tree. (6)



9. Explain about static data flow model and dynamic data flow model. Why do we need checkpointing in parallel and distributed system. (4+2)

10. Write short notes on (**any two**) : (3+3)

a) Multiple reduction on operations on a single set of data

b) Engineering model in open distributed software system

c) CU / PE Ovelap

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Master Level / I Year/ Ist Semester/ Science
Computer Science and Information Technology (CSc. 531)
(Advance Operating Systems)

Full Marks: 60
Pass Marks: 30
Time: 3 hours.

Candidates are required to give their answers in their own words as for as practicable.
All questions carry equal marks.

Attempt all questions.

1. *However the multi-processor model is relatively easier and less complex, the multi-programming model is heavily researched in OS literature.* If you agree the statement, justify with illustrations.

2. Illustrate the pros and cons of weighted round-robin based scheduling with an example scenario consisting four processes with following process details:

   $$P_i = (\tau_i, \varphi_i)$$

   Where τ = timestap after system start and φ = required sevvice time.

   The four processes are $P_1 = (1, 4)$, $P_2 = (3, 8)$, $P_3 = (4, 2)$, $P_4 = (6, 4)$. State your assumption on the values of quantum values, context switching overhead, and weight scheme.

3. Suppose that disk drive has 4000 cylinders, numbered 0 to 3999. The drive is currently serving a request at cylinder 229 and the previous request was at cylinder 361. The queue of pending requests, in FIFO order, is 916, 1509, 82, 1011, 1774, 130, 507, 2681, 56, Which algorithm for disk-arm scheduling among FCFS, SSF and SCAN is better for this set of requests?

4. Explain the working principle of paging system and at least three types of page replacement techniques.

5. What is the specialty about journaling file system? Explain the implementation details of JFS.

6. What are the different levels of security threats to be considered while designing any computer system? Explain form the system perspective.

7. Is there any difference between Distributed Operating System and Network Operating System? If yes, explain with all details.

8. Prepare a comparative note on various algorithms used in real-time scheduling.

9. Write short notes:
   (a) Compression requirement of Multimedia OS
   (b) CORBA

10. Compare the followings:
   (a) Ostrich algorithm vs. Bankers algorithm
   (b) Capability based vs. language based security mechanisms

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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 Servive) 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)

M.Sc. CSc. 539-2077 ✡

Tribhuvan University
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2077

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Master Level / I Year/ Ist 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. **(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.

Bishnu Bhattarai

M.Sc. CSc. 540-2077 ✡

Tribhuvan University
Institute of Science and Technology
2077
✡

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 for as practicable.
The figures in the margin indicate full marks.

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 j th entry if $0 < j - i \leq a_i$

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)

Bishnu Bhattarai

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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 for 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?

M.Sc. CSc. 544-2077 ✡

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Master Level / I Year/ Ist 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 for as practicable.
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 {2,4,2,3}. (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)

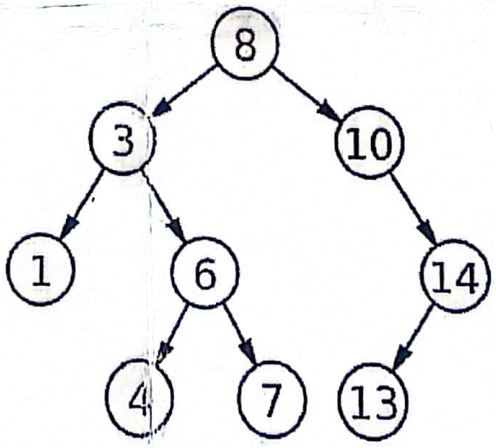
Group B

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)



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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Master Level / I Year/ Ist Semester/ Science — Full Marks: 45
Computer Science and Information Technology (CSc. 539) — Pass Marks: 22.5
(Object Orientation Software Engineering) — 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
Computer Science and Information Technology (CSc. 544)
(Parallel and Distributed Computing)

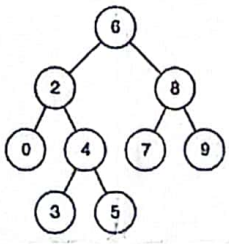
Full Marks: 45
Pass Marks: 22.5
Time: 2 hours.

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

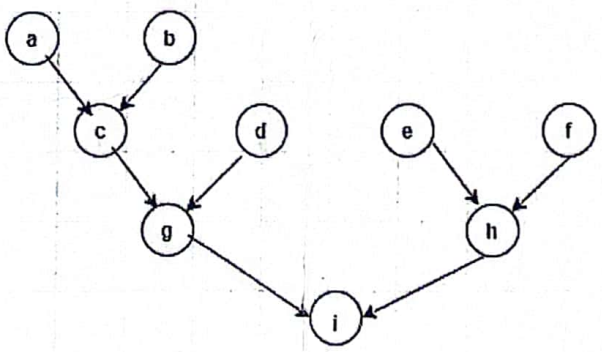
Group A

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 aray {5, 78, 4, 99, -7, 45, 3, 2}. [2 + 3]
8. Explain the properties of petri nets. [5]

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

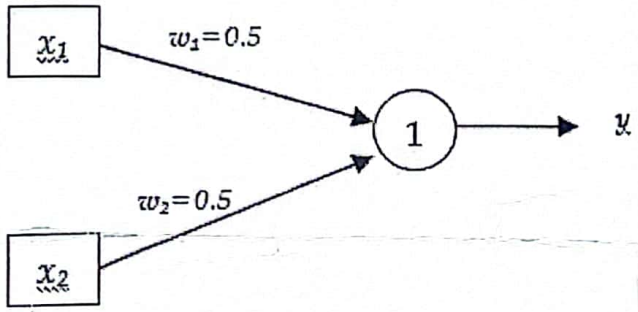
Full Marks: 45
Pass Marks: 22.5
Time: 2 hours.

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

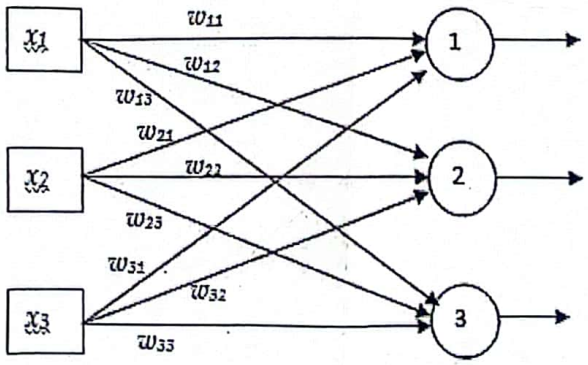
Group A

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 $\alpha = 0.1 \quad \beta = 0.8$.



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.

Group B

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

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	1	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 / 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. **(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 with stateless file system.

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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 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	25	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

M.Sc. CSc. 545-2078 ✡

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Master Level / I Year/ Ist Semester/ Science — Full M
Computer Science and Information Technology (CSc. 545) — Pass M
(Algorithmic Mathematics) — Time:

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

Group A

Long questions:
Attempt any two questions. [2×

1. Explain "system of linear equations". Write an algorithm to find the roots of equation using Newton Raphson's method and Trace the algorithms with o example.

2. What do you mean by numerical differentiation? Write an algorithm for central quotient formula with example.

3. What is joint probability distribution? Explain Poisson's distribution with suitabl Write down its algorithm

Group B

Short questions:
Attempt all questions. [5×

4. What are uses of Newton interpolation? Write down its equation, algorithm and [5]
5. Explain Fast Fourier Transformation with suitable example. [5]
6. What do you mean by Optimization? What are application areas of Integer Progr

[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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C.Sc. 540-2080 ✡

Tribhuvan University
Institute of Science and Technology
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Master Level / 1 Year/ Ist Semester/ Science
Computer Science and Information Technology (C.Sc. 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. What are probabilistic and randomized algorithms? Compare and contrast on Monte Carlo and Las Vegas algorithms. (2+8)

2. Explain prefix computation in butterfly network with an example of your own. (10)

3. What is packet routing in Mesh? Demonstrate the broadcasting algorithm on Mesh. (5+5)

Group B

Short answer questions:

Attempt all questions. **(5×5=25)**

4. Explain Aggregate method of complexity analysis with an example of your own. (5)

5. Explain the job Sequencing with deadline problem and its solution using greedy approach. (5)

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

7. How can you compute Rank in a linear Array? Explain. (5)

8. Write Short notes on: (2×2.5=5)
   a. Subset Sum problem
   b. Prefix computation in Mesh

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Master Level / I Year/ Ist Semester/ Science
Computer Science and Information Technology (C.Sc. 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. **[2×10=20]**

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

Process	Priority	Burst Time	Arrival Time
P1	2	5	0
P2	1	3	0
P3	8	2	2
P4	4	1	2
P5	5	4	3

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

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)? [10]

2. Define cryptography. Explain asymmetric encryption with algorithm and an example. [10]
3. Define RTS (Real Time System). Explain its various characteristics. Describe the approaches for translating addresses in RTS. [10]

Group B

Short answer questions:
Attempt all questions. **[5×5=25]**

4. Define DFS (Distributed File System) and explain DFS structure. [5]
5. Explain the sequence of steps involved in handling a page fault in demand paging. [5]
6. Explain sequential access and direct access methods in a file system. [5]
7. Explain the implementation of access matrix in the context of protection using Global Table and List of Objects. [5]
8. Compare MPEG1, MPEG2 and MPEG4. [5]

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Master Level / I Year/ Ist Semester/ Science — Full Marks: 45
Computer Science and Information Technology (CSc. 539) — Pass Marks: 22.5
(Object Orientation Software Engineering) — 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. Differentiate between software process and software process model. Compare waterfall model and prototype model.
2. Explain component based software engineering and compare it with traditional software engineering process.
3. Explain the Hierarchial Object Oriented Design (HOOD) and compare with traditional object oriented design method.

Group B

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

4. Discus the analysis model with example.
5. Explain the testing and verification process in rea time system.
6. Differentiate between function/data oriented method with object-oriented method.
7. Explain software quality assurance.
8. Compare object modeling technique with responsibility driven design.

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

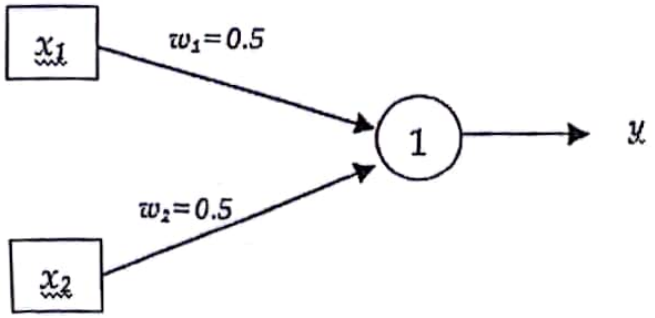
Full Marks: 45
Pass Marks: 22.5
Time: 2 hours.

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

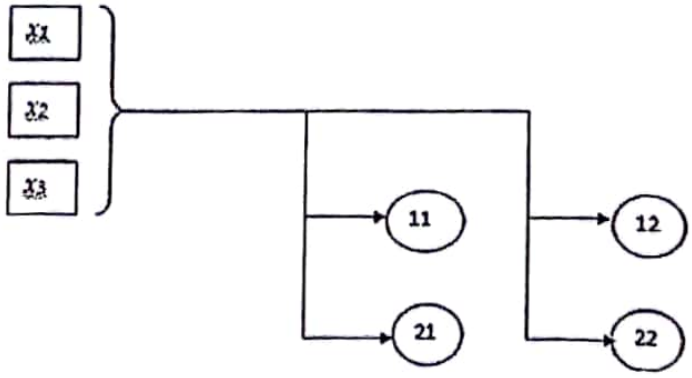
Group A

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 (0.1, 0.4, 0.5) using RMSProp. Assume $\alpha = 0.2 \quad \beta = 0.9$.



2. Consider following 2-D SOM and initial weight matrix. Show the working of SOM for the input (0.4, 0.1, 0.2).



Initial Weight Matrix

0.1	0.2	0.4	0.3
0.2	0.5	0.3	0.1
0.6	0.4	0.3	0.2

3. What is vanishing gradient problem? Discuss architecture and mathematical formulation of LSTM.

Group B

Short answer questions:

Attempt all questions. (5×5=25)

4. What is activation function? Discuss about ReLU, Leaky ReLU and Softmax activation function.

5. Derive weight update rule for logistic regression using gradient descent method of optimization.

6. What is auto associative neural network? Store the pattern [1, 1, 1,-1] in an auto associative neural network. Find weight matrix and test the input vector [-1, 1, 1, -1].

7. Solve the XOR problem using RBF by taking (0,0) and (1,1) as centers.

8. Consider following data points: (1,5,1),(2,6, 1),(3,8, 1),(3,5,1), (6,1,-1),(7,2,-1),(7,3,-1),(8,1,-1). Determine the equation of hyperplane that divides the above data points into two classes.

C.Sc. 540-2080 ✡

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Institute of Science and Technology
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Master Level / 1 Year/ Ist Semester/ Science
Computer Science and Information Technology (C.Sc. 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. What are probabilistic and randomized algorithms? Compare and contrast on Monte Carlo and Las Vegas algorithms. (2+8)

2. Explain prefix computation in butterfly network with an example of your own. (10)

3. What is packet routing in Mesh? Demonstrate the broadcasting algorithm on Mesh. (5+5)

Group B

Short answer questions:

Attempt all questions. **(5×5=25)**

4. Explain Aggregate method of complexity analysis with an example of your own. (5)

5. Explain the job Sequencing with deadline problem and its solution using greedy approach. (5)

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

7. How can you compute Rank in a linear Array? Explain. (5)

8. Write Short notes on: (2×2.5=5)
   a. Subset Sum problem
   b. Prefix computation in Mesh

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Master Level / I Year/ Ist Semester/ Science
Computer Science and Information Technology (C.Sc. 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. **[2×10=20]**

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

Process	Priority	Burst Time	Arrival Time
P1	2	5	0
P2	1	3	0
P3	8	2	2
P4	4	1	2
P5	5	4	3

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

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)? [10]

2. Define cryptography. Explain asymmetric encryption with algorithm and an example. [10]
3. Define RTS (Real Time System). Explain its various characteristics. Describe the approaches for translating addresses in RTS. [10]

Group B

Short answer questions:
Attempt all questions. **[5×5=25]**

4. Define DFS (Distributed File System) and explain DFS structure. [5]
5. Explain the sequence of steps involved in handling a page fault in demand paging. [5]
6. Explain sequential access and direct access methods in a file system. [5]
7. Explain the implementation of access matrix in the context of protection using Global Table and List of Objects. [5]
8. Compare MPEG1, MPEG2 and MPEG4. [5]

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Master Level / I Year/ Ist Semester/ Science — Full Marks: 45
Computer Science and Information Technology (CSc. 539) — Pass Marks: 22.5
(Object Orientation Software Engineering) — 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. Differentiate between software process and software process model. Compare waterfall model and prototype model.
2. Explain component based software engineering and compare it with traditional software engineering process.
3. Explain the Hierarchial Object Oriented Design (HOOD) and compare with traditional object oriented design method.

Group B

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

4. Discus the analysis model with example.
5. Explain the testing and verification process in rea time system.
6. Differentiate between function/data oriented method with object-oriented method.
7. Explain software quality assurance.
8. Compare object modeling technique with responsibility driven design.

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

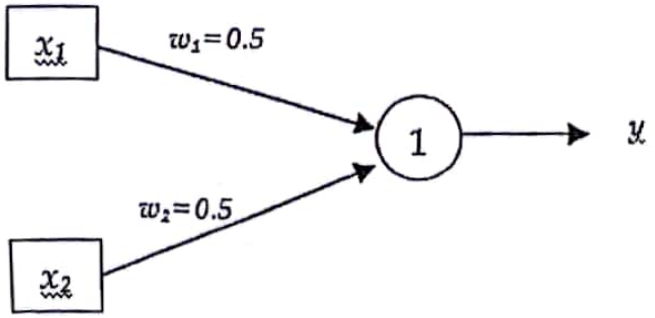
Full Marks: 45
Pass Marks: 22.5
Time: 2 hours.

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

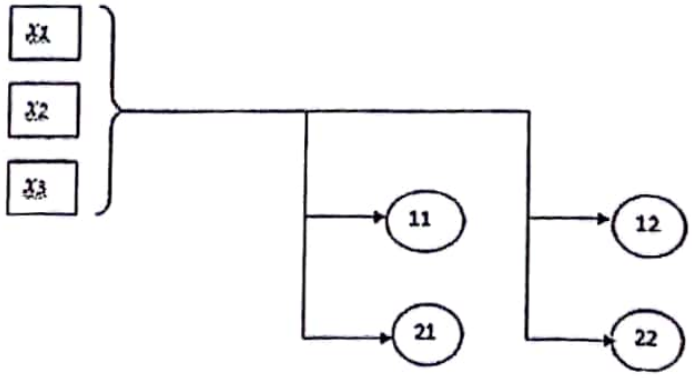
Group A

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 (0.1, 0.4, 0.5) using RMSProp. Assume $\alpha = 0.2 \quad \beta = 0.9$.



2. Consider following 2-D SOM and initial weight matrix. Show the working of SOM for the input (0.4, 0.1, 0.2).



Initial Weight Matrix

0.1	0.2	0.4	0.3
0.2	0.5	0.3	0.1
0.6	0.4	0.3	0.2

3. What is vanishing gradient problem? Discuss architecture and mathematical formulation of LSTM.

Group B

Short answer questions:

Attempt all questions. (5×5=25)

4. What is activation function? Discuss about ReLU, Leaky ReLU and Softmax activation function.

5. Derive weight update rule for logistic regression using gradient descent method of optimization.

6. What is auto associative neural network? Store the pattern [1, 1, 1,-1] in an auto associative neural network. Find weight matrix and test the input vector [-1, 1, 1, -1].

7. Solve the XOR problem using RBF by taking (0,0) and (1,1) as centers.

8. Consider following data points: (1,5,1),(2,6, 1),(3,8, 1),(3,5,1), (6,1,-1),(7,2,-1),(7,3,-1),(8,1,-1). Determine the equation of hyperplane that divides the above data points into two classes.

C.Sc. 540-2080 ✡

Tribhuvan University
Institute of Science and Technology
2080
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Master Level / 1 Year/ Ist Semester/ Science
Computer Science and Information Technology (C.Sc. 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. What are probabilistic and randomized algorithms? Compare and contrast on Monte Carlo and Las Vegas algorithms. (2+8)

2. Explain prefix computation in butterfly network with an example of your own. (10)

3. What is packet routing in Mesh? Demonstrate the broadcasting algorithm on Mesh. (5+5)

Group B

Short answer questions:

Attempt all questions. **(5×5=25)**

4. Explain Aggregate method of complexity analysis with an example of your own. (5)

5. Explain the job Sequencing with deadline problem and its solution using greedy approach. (5)

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

7. How can you compute Rank in a linear Array? Explain. (5)

8. Write Short notes on: (2×2.5=5)
   a. Subset Sum problem
   b. Prefix computation in Mesh

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Master Level / I Year/ Ist Semester/ Science
Computer Science and Information Technology (C.Sc. 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. **[2×10=20]**

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

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

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3. Define RTS (Real Time System). Explain its various characteristics. Describe the approaches for translating addresses in RTS. [10]

Group B

Short answer questions:
Attempt all questions. **[5×5=25]**

4. Define DFS (Distributed File System) and explain DFS structure. [5]
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Master Level / I Year/ Ist Semester/ Science — Full Marks: 45
Computer Science and Information Technology (CSc. 539) — Pass Marks: 22.5
(Object Orientation Software Engineering) — 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. Differentiate between software process and software process model. Compare waterfall model and prototype model.
2. Explain component based software engineering and compare it with traditional software engineering process.
3. Explain the Hierarchial Object Oriented Design (HOOD) and compare with traditional object oriented design method.

Group B

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

4. Discus the analysis model with example.
5. Explain the testing and verification process in rea time system.
6. Differentiate between function/data oriented method with object-oriented method.
7. Explain software quality assurance.
8. Compare object modeling technique with responsibility driven design.

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

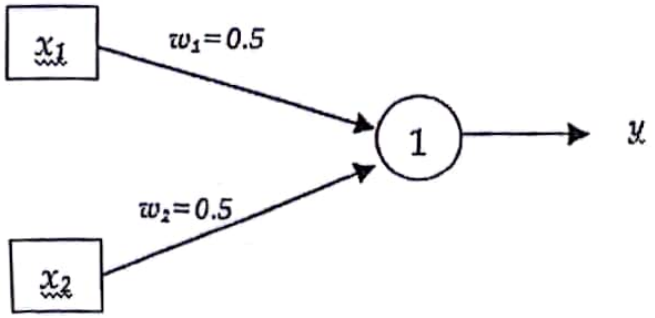
Full Marks: 45
Pass Marks: 22.5
Time: 2 hours.

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

Group A

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 (0.1, 0.4, 0.5) using RMSProp. Assume $\alpha = 0.2 \quad \beta = 0.9$.



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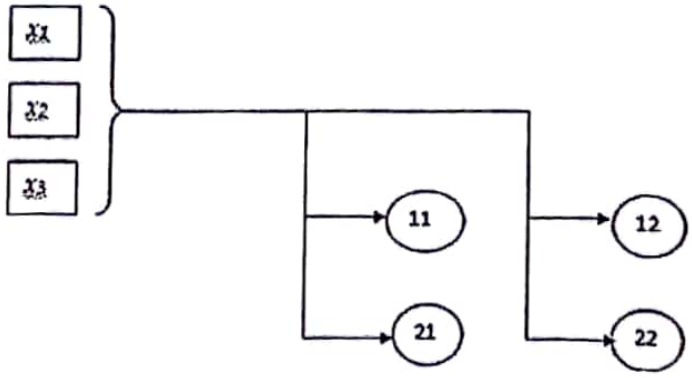

Initial Weight Matrix

0.1	0.2	0.4	0.3
0.2	0.5	0.3	0.1
0.6	0.4	0.3	0.2

3. What is vanishing gradient problem? Discuss architecture and mathematical formulation of LSTM.

Group B

Short answer questions:

Attempt all questions. (5×5=25)

4. What is activation function? Discuss about ReLU, Leaky ReLU and Softmax activation function.

5. Derive weight update rule for logistic regression using gradient descent method of optimization.

6. What is auto associative neural network? Store the pattern [1, 1, 1,-1] in an auto associative neural network. Find weight matrix and test the input vector [-1, 1, 1, -1].

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C.Sc. 540-2080 ✡

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✡

Master Level / 1 Year/ Ist Semester/ Science
Computer Science and Information Technology (C.Sc. 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. What are probabilistic and randomized algorithms? Compare and contrast on Monte Carlo and Las Vegas algorithms. (2+8)

2. Explain prefix computation in butterfly network with an example of your own. (10)

3. What is packet routing in Mesh? Demonstrate the broadcasting algorithm on Mesh. (5+5)

Group B

Short answer questions:

Attempt all questions. **(5×5=25)**

4. Explain Aggregate method of complexity analysis with an example of your own. (5)

5. Explain the job Sequencing with deadline problem and its solution using greedy approach. (5)

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

7. How can you compute Rank in a linear Array? Explain. (5)

8. Write Short notes on: (2×2.5=5)
   a. Subset Sum problem
   b. Prefix computation in Mesh

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Master Level / I Year/ Ist Semester/ Science
Computer Science and Information Technology (C.Sc. 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. **[2×10=20]**

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

Process	Priority	Burst Time	Arrival Time
P1	2	5	0
P2	1	3	0
P3	8	2	2
P4	4	1	2
P5	5	4	3

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

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)? [10]

2. Define cryptography. Explain asymmetric encryption with algorithm and an example. [10]
3. Define RTS (Real Time System). Explain its various characteristics. Describe the approaches for translating addresses in RTS. [10]

Group B

Short answer questions:
Attempt all questions. **[5×5=25]**

4. Define DFS (Distributed File System) and explain DFS structure. [5]
5. Explain the sequence of steps involved in handling a page fault in demand paging. [5]
6. Explain sequential access and direct access methods in a file system. [5]
7. Explain the implementation of access matrix in the context of protection using Global Table and List of Objects. [5]
8. Compare MPEG1, MPEG2 and MPEG4. [5]

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Master Level / I Year/ Ist Semester/ Science — Full Marks: 45
Computer Science and Information Technology (CSc. 539) — Pass Marks: 22.5
(Object Orientation Software Engineering) — 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. Differentiate between software process and software process model. Compare waterfall model and prototype model.
2. Explain component based software engineering and compare it with traditional software engineering process.
3. Explain the Hierarchial Object Oriented Design (HOOD) and compare with traditional object oriented design method.

Group B

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

4. Discus the analysis model with example.
5. Explain the testing and verification process in rea time system.
6. Differentiate between function/data oriented method with object-oriented method.
7. Explain software quality assurance.
8. Compare object modeling technique with responsibility driven design.

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

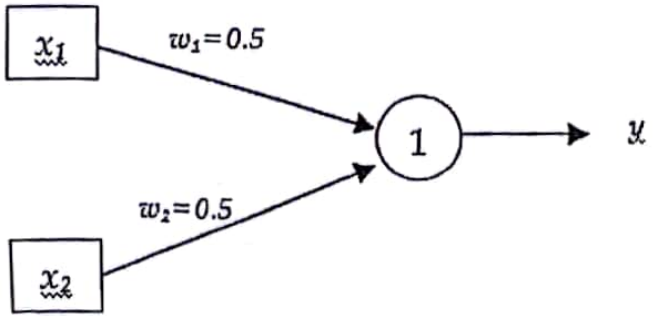
Full Marks: 45
Pass Marks: 22.5
Time: 2 hours.

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

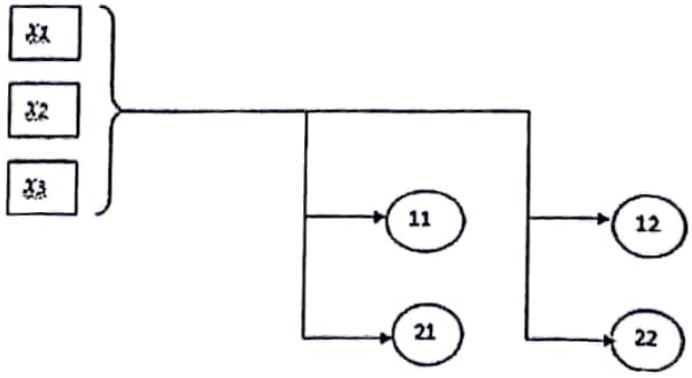
Group A

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 (0.1, 0.4, 0.5) using RMSProp. Assume $\alpha = 0.2 \quad \beta = 0.9$.



2. Consider following 2-D SOM and initial weight matrix. Show the working of SOM for the input (0.4, 0.1, 0.2).



Initial Weight Matrix

0.1	0.2	0.4	0.3
0.2	0.5	0.3	0.1
0.6	0.4	0.3	0.2

3. What is vanishing gradient problem? Discuss architecture and mathematical formulation of LSTM.

Group B

Short answer questions:

Attempt all questions. (5×5=25)

4. What is activation function? Discuss about ReLU, Leaky ReLU and Softmax activation function.

5. Derive weight update rule for logistic regression using gradient descent method of optimization.

6. What is auto associative neural network? Store the pattern [1, 1, 1,-1] in an auto associative neural network. Find weight matrix and test the input vector [-1, 1, 1, -1].

7. Solve the XOR problem using RBF by taking (0,0) and (1,1) as centers.

8. Consider following data points: (1,5,1),(2,6, 1),(3,8, 1),(3,5,1), (6,1,-1),(7,2,-1),(7,3,-1),(8,1,-1). Determine the equation of hyperplane that divides the above data points into two classes.

C.Sc. 540-2080 ✡

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2080
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Master Level / 1 Year/ Ist Semester/ Science
Computer Science and Information Technology (C.Sc. 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. What are probabilistic and randomized algorithms? Compare and contrast on Monte Carlo and Las Vegas algorithms. (2+8)

2. Explain prefix computation in butterfly network with an example of your own. (10)

3. What is packet routing in Mesh? Demonstrate the broadcasting algorithm on Mesh. (5+5)

Group B

Short answer questions:

Attempt all questions. **(5×5=25)**

4. Explain Aggregate method of complexity analysis with an example of your own. (5)

5. Explain the job Sequencing with deadline problem and its solution using greedy approach. (5)

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

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8. Write Short notes on: (2×2.5=5)
   a. Subset Sum problem
   b. Prefix computation in Mesh

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Master Level / I Year/ Ist Semester/ Science
Computer Science and Information Technology (C.Sc. 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. **[2×10=20]**

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

Process	Priority	Burst Time	Arrival Time
P1	2	5	0
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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)? [10]

2. Define cryptography. Explain asymmetric encryption with algorithm and an example. [10]
3. Define RTS (Real Time System). Explain its various characteristics. Describe the approaches for translating addresses in RTS. [10]

Group B

Short answer questions:
Attempt all questions. **[5×5=25]**

4. Define DFS (Distributed File System) and explain DFS structure. [5]
5. Explain the sequence of steps involved in handling a page fault in demand paging. [5]
6. Explain sequential access and direct access methods in a file system. [5]
7. Explain the implementation of access matrix in the context of protection using Global Table and List of Objects. [5]
8. Compare MPEG1, MPEG2 and MPEG4. [5]

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Master Level / I Year/ Ist Semester/ Science — Full Marks: 45
Computer Science and Information Technology (CSc. 539) — Pass Marks: 22.5
(Object Orientation Software Engineering) — 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. Differentiate between software process and software process model. Compare waterfall model and prototype model.
2. Explain component based software engineering and compare it with traditional software engineering process.
3. Explain the Hierarchial Object Oriented Design (HOOD) and compare with traditional object oriented design method.

Group B

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

4. Discus the analysis model with example.
5. Explain the testing and verification process in rea time system.
6. Differentiate between function/data oriented method with object-oriented method.
7. Explain software quality assurance.
8. Compare object modeling technique with responsibility driven design.

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

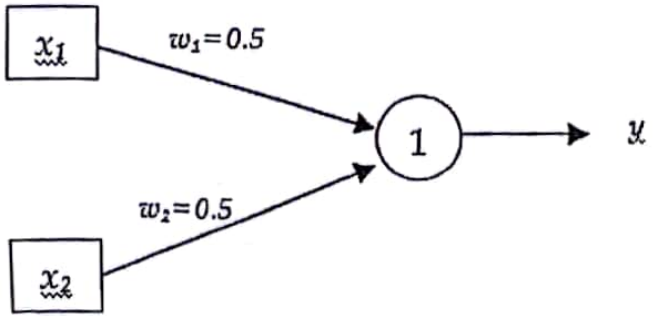
Full Marks: 45
Pass Marks: 22.5
Time: 2 hours.

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

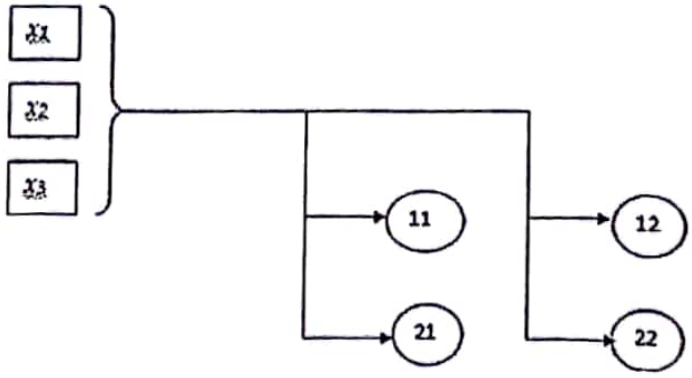
Group A

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 (0.1, 0.4, 0.5) using RMSProp. Assume $\alpha = 0.2 \quad \beta = 0.9$.



2. Consider following 2-D SOM and initial weight matrix. Show the working of SOM for the input (0.4, 0.1, 0.2).



Initial Weight Matrix

0.1	0.2	0.4	0.3
0.2	0.5	0.3	0.1
0.6	0.4	0.3	0.2

3. What is vanishing gradient problem? Discuss architecture and mathematical formulation of LSTM.

Group B

Short answer questions:

Attempt all questions. (5×5=25)

4. What is activation function? Discuss about ReLU, Leaky ReLU and Softmax activation function.

5. Derive weight update rule for logistic regression using gradient descent method of optimization.

6. What is auto associative neural network? Store the pattern [1, 1, 1,-1] in an auto associative neural network. Find weight matrix and test the input vector [-1, 1, 1, -1].

7. Solve the XOR problem using RBF by taking (0,0) and (1,1) as centers.

8. Consider following data points: (1,5,1),(2,6, 1),(3,8, 1),(3,5,1), (6,1,-1),(7,2,-1),(7,3,-1),(8,1,-1). Determine the equation of hyperplane that divides the above data points into two classes.

Tribhuvan University
Institute of Science and Technology
Central Department of Computer Science and IT
Second Term -2080

Program: Masters
Subject: Parallel and Distributed Computing
Code: C.Sc. 544

Year/ Sem: II/ III
Time: 2 Hrs.
FM/ PM: 45/22.5

Section A

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

1. Define petri net with example. Explain any two models for semantics of concurrent programming. [3+7]
2. Why do we need leader in distributed computing? Describe any two leader election algorithm. [2+8]
3. Explain about k-criterion BSR with examples, where k = 1, 2 and 3. [10]

Section B

Attempt all questions. (5 × 5 = 25)

4. *Describe about open distributed software system.* [5]
5. How do we manage checkpointing in parallel and distributed system? [5]
6. Describe about data driven and demand driven data flow model. [5]
7. How do you sort the array with duplicate elements using parallel algorithm? [5]
8. Write short notes on [5]
   a. Data parallel algorithm
   b. Parallel processing paradigms

Tribhuvan University
Institute of Science and Technology
Central Department of Computer Science and IT
Second Term -2080

Program: Masters
Subject: Object Oriented Analysis and Design
Code: C.Sc. 539

Year/ Sem: II/ III
Time: 2 Hrs.
FM/ PM: 45/22.5

Section A

Attempt any two questions **[2x10=20]**

1. Explain the software process. Compare between Object-Oriented software engineering and Object-Oriented software development. [4+6]
2. Discuss the Object-Oriented system design and Object-Oriented program design with practical example. [10]
3. Explain the different phases of software requirement engineering with example. [10]

Section B

Attempt all questions **[5×5=25]**

4. Write down about Object Orientation analysis. [5]
5. Discuss about component management with example. [5]
6. Describe the requirement model used in software development. [5]
7. Why project management is important in software development. [5]
8. Write notes on hierarchical object-Oriented design. [5]

Tribhuvan University
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Central Department of Computer Science and IT
Second Term -2080

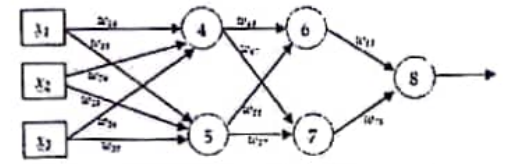
Program: Masters
Subject: Neural Network
Code: C.Sc. 543

Year/ Sem: II/III
Time: 2 Hrs.
FM/ PM: 45/22.5

Section A

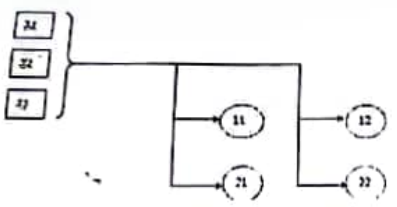
Attempt any two questions **[2x10=20]**

1. Consider a MLP given below. Let the learning rate be 1. The initial weights of the network are given in the table below. Assume that first training tuple is (0, 1, 1) and its target output is 1. Calculate weight updates by using back-propagation algorithm. Assume logistic activation function



W_{14}	W_{15}	W_{24}	W_{25}	W_{34}	W_{35}	W_{46}	W_{47}	W_{56}	W_{57}	W_{68}	W_{78}
0.6	0.4	0.2	-0.3	0.7	-0.6	0.4	0.7	0.1	0.8	0.2	0.5

2. Consider following 2-D SOM and 3-D inputs. Show the working of SOM for the *inputs (0.2,0.3;0.6)*



0.1	0.2	0.4	0.2
0.4	0.3	0.2	0.5
0.7	0.5	0.6	0.3

3. What is BPTT? Derive weight update rules for BPTT algorithm.

Section B

Attempt all questions **[5×5=25]**

4. What is activation function? Discuss various activation functions used ANNs.
5. Define polynomial curve fitting. Derive weight update rule for polynomial curve fitting.
6. Discuss the concept of gradient descent. Compare and Contrast between batch and online learning.
7. Consider a 4-bit grayscale image having resolution 5x5 and filter of size 3x3. Show convolution operation on the image.
8. State XOR problem. How RBF can be used to solve XOR problem? Explain with example.

Tribhuvan University
Institute of Science and Technology
Central Department of Computer Science and IT
Second Term -2080

Program: Masters
Subject: Algorithms and Complexity
Code: C.Sc. 540

Year/ Sem: II/ III
Time: 2 Hrs.
FM/ PM: 45/22.5

Section A

Attempt any two questions **[2x10=20]**

1. Let X1 = 2, 6, 8, 15 and X2 = 3, 7, 9, 1. Perform odd even merge sort in a Butterfly Network.
2. Explain embedding of binary tree on Hypercube. Calculate Expansion, Dilation and Congestion.
3. Explain aggregate method of amortized analysis with reference to Hash Table.

Section B

Attempt all questions **[5×5=25]**

4. Perform shear sort (in Mesh) on the following [5]

5	6	4	12
13	2	14	7
1	15	8	16
11	9	3	10

5. Explain ski-rental problem with necessary equations. [5]
6. Explain any one work optimal PRAM algorithm with an example of your own. [5]
7. Differentiate between Las Vegas and Monte Carlo algorithm. Which one is better and why? [4+1]
8. Write short notes [2*2.5=5]
   a. NP problem
   b. Back Tracking

Tribhuvan University
Institute of Science and Technology
Central Department of Computer Science and IT
Second Term -2080

Program: Masters
Subject: Advanced Operating Systems
Code: C.Sc. 538

Year/ Sem: II/ III
Time: 2 Hrs.
FM/ PM: 45/22.5

Section A

Attempt any two questions **[2x10=20]**

1. Consider the following set of processes with the length of the CPU burst given in millisecond: [10]

Process	Priority	Burst Time
P1	2	5
P2	5	3
P3	3	4
P4	1	6
P5	4	7

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. Define encryption? Mention the different types of encryptions. Show algorithm with an example for asymmetric encryption algorithm. [10]
3. What do you mean by RTS (Real Time System)? Explain its various characteristics. Describe the approaches for translating addresses in RTS [10]

Section B

Attempt all questions **[5×5=25]**

4. What is IPC? Explain message passing and shared memory modes of IPC. [5]
5. Explain the sequence of steps involved in handling a page fault in demand paging. [5]
6. Define the following terms: Track, Cylinder, Seek time, Transfer Rate and Rotational Latency in the context of HDD. [5]
7. Explain the implementation of access matrix in the context of protection using Global Table and List of Objects. [5]
8. Compare and contrast between stateful file system with stateless file system. [5]