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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2076
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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. 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 — Full Marks: 45

Computer Science and Information Technology (CSc. 540) — Pass Marks: 22.5

(Algorithms and Complexity) — 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

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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)

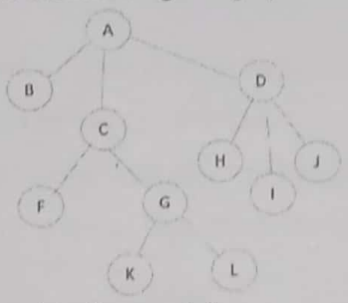
1. When a program is said to be partial and total correct? List the difference and similarities between process algebra and process graph. Describe the properties of petri net. (2 + 2 + 6)
2. Explain the components of scheduling system model. (10)
3. List the types of PAM model. Illustrate the BSR algorithm 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

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

Computer Science and Information Technology (CSc. 545) — Pass Marks: 22.5

(Algorithmic Mathematics) — 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
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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. 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.

CSc. 539-2074 ✡

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. 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.

CSc. 540-2074 ✡

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. 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 ✡

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2074

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

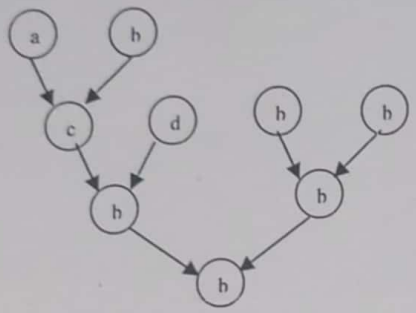
Full Marks: 45
Pass Marks: 22.5
Time: 2 hours.

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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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. 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
Institute of Science and Technology
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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.

ICSc. 544-2073 ✡

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. 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)

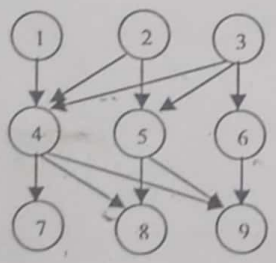
Group B

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

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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.

1CSc. 538-2072 ✡

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. 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.

1CSc. 539-2072 ✡

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. 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 ✡

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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

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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
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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
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2071

✡

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
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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
Institute of Science and Technology
2075
✡

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.

Tribhuvan University
Institute of Science and Technology
2075

✡

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
2075

✡

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 ✡

Tribhuvan University
Institute of Science and Technology
2075

✡

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

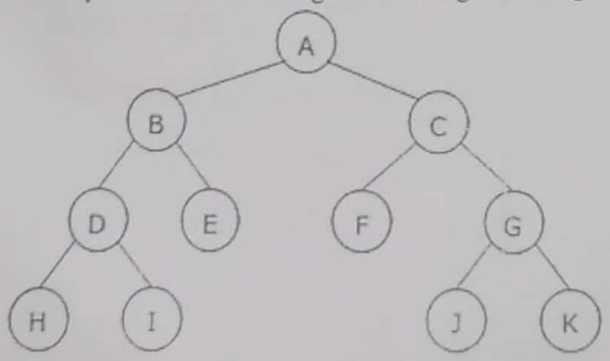
Short questions:
Attempt all questions. **(5x5=25)**

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 Full Marks: 60
Computer Science and Information Technology (CSc. 535) Pass Marks: 30
(Parallel and Distributed Computing) 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)

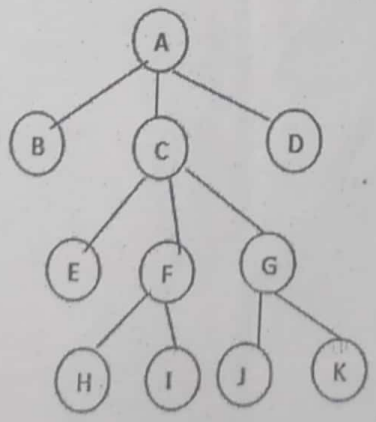
5. Explain in brief about the classes of PRAM according to restrictions on shared memory. Discuss about List ranking PRAM algorithm. (3+3)

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