

Tribhuvan University  
Institute of Science and Technology  
2075  
☆

Master Level / First Year/ IInd Semester/ Science  
**Computer Science and Information Technology (CSc. 559)**  
(Web Systems and Algorithm)

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

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

**Group A**

**Attempt any two questions.**

(10×2=20)

1. What is the significance of link in page ranking? Which one has more power, either click analysis or link analysis? How can we rank the pages without link? Explain.
2. In which case clustering is more appropriate than classification. Compare the algorithm of k-means and k-medoids with merits and demerits of each algorithm.
3. Differentiate between the collaborative filtering and content based recommendation. List merits and demerits of each of them.

**Group B**

**Attempt ALL questions.**

(5×5=25)

4. Does the value of epsilon affect DBSCAN algorithm? Describe the working mechanism of DBSCAN algorithm.
5. Illustrate how ID3 algorithm is used in attribute selection in decision tree induction.
6. Describe some ambiguity in searching. How click analysis solve this problem.
7. How does indexing contribute in searching? justify with an example.
8. Write short notes on. (Any TWO):
  - a. Web ontology
  - b. Damping factor
  - c. Spider and crawler



Master Level / First Year/ IInd Semester/ Science  
Computer Science and Information Technology (CSc. 561)  
(Machine Learning)

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

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

**Group A**

**Attempt any two questions.**

(10x2=20)

1. What is gradient descent algorithm? Explain its variants.
2. What is the difference between forward search and backward search in wrapper model? Explain wrapper model for feature selection with forward search algorithm.
3. Define the terms associated with Markov decision processes (MDP) that formalizes the reinforcement learning with concrete example.

**Group B**

**Attempt All questions.**

(5x5=25)

1. Define exponential family distributions. Show that Gaussian distribution is an example of exponential family distributions.
2. State Hoeffding inequality and illustrate the theorem suitable example.
3. Write k-means clustering algorithm with arbitrary example of training set having two features.
4. Define Eigen vectors and Eigen values. Explain how principal components of the given data is used for dimensionality reduction.
5. Write short notes on:
  - a. Locally weighted linear regression
  - b. Jensen's inequality



Master Level / First Year/ IInd Semester/ Science  
Computer Science and Information Technology (CSc. 562)  
(Computational Geometry)

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

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

Group A

Attempt any two questions.

(10x2=20)

1. How Turn Test is used for determining intersection of segments? How Plane-Sweep algorithm for segment intersection determines the possible intersections in a given set of segments. Support your answer with an illustration. [3+7]
2. How 3D objects are represented using DCEL? Discuss Quick Hull approach for finding convex hull of a set of points. How efficient the Quick Hull algorithm is? [3+5+2]
3. Define Voronoi Polygon. What is the largest empty circle problem in Voronoi diagram? Write an algorithm for computing largest empty circle for a given set of point sites? [2+3+5]

Group B

Attempt All questions.

(5x5=25)

4. What is the diagonal of a polygon? Prove that every polygon with vertex size more than four has a diagonal. [1+4]
5. How a polygon can be triangulated using repeated ear removal approach? Perform the complexity analysis of the approach. [4+1]
6. What is 2d range search problem? How kd-trees are used for representing range search problems? [1+4]
7. How visibility graph is constructed from a given obstacle sets and Robot positions? Illustrate with an example. [5]
8. What is global vertex numbering? Given elements to vertex representation of mesh, now sketch the mesh triangulation using the vertex numbering listed below; [2+3]  
Triangle 1: 4, 5, 6; Triangle 2: 2, 3, 6; Triangle 3: 3, 4, 6; Triangle 4: 2, 6, 7  
Triangle 5: 1, 2, 7

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Master Level / First Year/ IInd Semester/ Science  
**Computer Science and Information Technology (CSc. 564)**  
(Data Warehousing and Data Mining)

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

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

**Group A**

**Attempt any two questions.**

(10×2=20)

1. What are the different components of data warehouse? Explain with the help of diagram.
2. What is query directed mining? Explain LIFT with example.
3. What are the demerits of k-means algorithm? Explain how k-medoids works?

**Group B**

**Attempt ALL questions.**

(5×5=25)

4. How does density based clustering algorithm work? Describe. (5)
5. What is data generation? Explain attribute oriented induction approaches. (5)
6. What is web mining Taxonomy? Explain its challenges. (5)
7. Compare and contrast OLTP and data warehouse. (5)
8. Write short notes (Any Two) (2×2.5=5)
  - a) Decision Tree
  - b) Outlier Analysis
  - c) Data Discretization



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Master Level / First Year/ IInd Semester/ Science  
Computer Science and Information Technology (CSc. 565)  
(Systems Programming)

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

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

Group A

Attempt any two questions.

(10x2=20)

1. Write brief answer of the following questions.
  - a) Explain the difference between SIC and SIC/XE computers.
  - b) What is dynamic linking? write it's advantages.
  - c) How forward references are handled in one pass assemblers?
  - d) Explain about bootstrap loader

(4x2.5=10)

2. Consider following assembly program written for SIC/XE computer and answer the questions that follow.

(10)

Label	Operation	Op-code
ARRMUL	START	00000
FIRST	LDX	#0
	+LDB	#TABLE2
	BASE	TABLE2
LOOP	LDA	TABLE1,X
	MUL	TABLE2,X
	+STA	TABLE3,X
	TIX	COUNT
	JLT	LOOP
TABLE1	RESW	1026
TABLE2	RESW	1026
TABLE3	RESW	1026
COUNT	RESW	1
	END	FIRST

c06

1302

- a) Generate LOC columns
- b) Generate object code column for the above program  
(Assume the Mnemonic Code as: LDX=04, LDB=68, LDA=00, MUL=18, STA=0C, TIX= 2C, JLT=38, )

(3)

(7)

3. For the assembly language program given in Question No. 1, provide solution as indicated in following questions:

(10)

(5)

- a. Create object code file
- b. Load object code file into memory and show all data structure used by loader. Assume that the program is loaded from memory location 1000.

(5)



**Group B****Attempt All Questions.**

{5x5=25}

4. Explain about different data structures used in Macro Processor.
5. Consider the macro definition given below and show macro expansion for the macro call statement REDBUFF F1, BUFFER, LENGTH, 1. Show all data structure used by macro processor clearly.

RDBUFF	MACRO	&INDEV, &BUFADR, &RECLTH
	CLEAR	X
	CLEAR	A
	CLEAR	S
	+LDT	#4096
\$LOOP	RDCHAR	&INDEV
	COMPR	A,S
	JEQ	\$EXIT
	STCH	&BUFADR, X
	TIXR	T
	JLT	\$LOOP
\$EXIT	STX	&RECLTH
	MEND	

6. Calculate the addressing mode and target address for the following instruction

- a. 022030  
b. 032600  
c. 0310C303

when (B)=006000, (PC)=003000, (X)=00090

7. Consider the following grammar:

<stmt>::=<read>|<write>  
<read>::= READ(<id-list>)  
<write>::= WRITE (<id-list>)  
<id-list>::=id |<id-list>,id

Devise token coding scheme for this grammar and design finite automata to recognize the tokens. Explain any assumption made in designing automata.

8. Write short notes on:

- a. Instruction set of SIC/XE  
b. Control Sections



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Master Level / First Year/ IInd Semester/ Science  
Computer Science and Information Technology (CSe. 558)  
(Compiler Optimization)

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

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

Group A

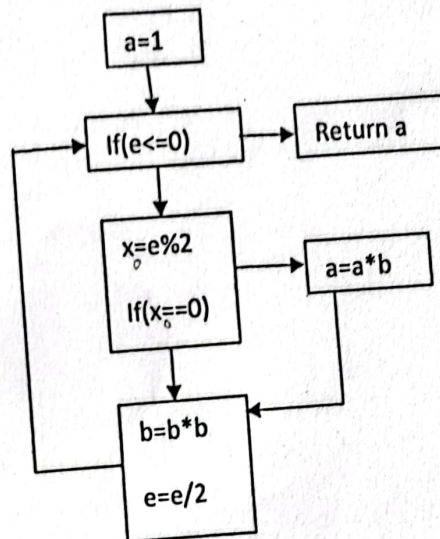
Attempt any two questions.

(10x2=20)

1. Define and classify SIV subscripts. Which dependence test would be applied to each subscript position? Perform the corresponding dependence testing.

```
DO I = 1, 3
  DO J = 1, 3
    DO K = 1, 3
      S1: A(I+1, 2J+2, K+1) = B(I, 2J, K)
      S2: C(I,J,K) = A(I,1,9-k)
    ENDDO
  ENDDO
ENDDO
```

2. Define SSA form. Convert the following into SSA form.



3. What is scalar expansion? Explain with an example how scalar expansion can be carried out? Also discuss regarding its profitability and drawbacks.

Group B

(5x5=25)

Attempt all questions.

4. Explain briefly about code optimization and its importance.

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- ✓ 5. What is loop normalization? Why is it important? Normalize the following loop.

```
for(i=7; i<max; i+=3)
```

```
{  
  A[i]=B[i] -5  
}
```

- ✓ 6. Prove that "any reordering transformation that preserves every dependence in a program preserves the meaning of that program".
- ✓ 7. What is branch optimization? Explain different types of branches in control flow analysis with examples.
- ✓ 8. Explain inline substitution with example. What are its advantage and disadvantages?