CSc. 551-2071 ✡

Tribhuvan University
Institute of Science and Technology
2071
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Master Level / First Year/ IInd Semester/ Science
Computer Science and Information Technology (CSc. 551)
(Compiler Optimization)

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 carry equal marks.

Attempt all questions.

1. Draw block diagram of compiler. Explain the optimization phase and its importance.
2. State and prove fundamental theorem of dependence with example.
3. Explain with example, the method of performing strong SIV test. Differentiate it with weak SIV test.
4. What do you understand by constant propagation? Explain the idea behind constant propagation algorithm.
5. Explain the advantages of scalar replacement of array elements with example.
6. Illustrate loop fussion and loop fission. Are they always appropriate? Explain.
7. What do you understand by branching? Explain different types of branching with example.
8. Define control dependence. Explain straightening process.
9. Define interprocedural analysis and optimization. Differentiate between flow sensitive and flow insensitive problems.
10. Explain inline substitution. Also explain its advantages.

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Master Level / First Year/ IInd Semester/ Science
Computer Science and Information Technology (CSc. 552)
(Web Systems and Algorithms)

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. List some examples of intelligent web applications? Describe the basic elements of intelligent applications. (2+4)

2. Explain about the working principle of search engine. How does ranking help users to get relevance documents. (4+2)

3. Recommendation is one of the important factors in intelligent web application. Justify this statement. Does the large scale of data affect the efficiency of recommendation engine? (4+2)

4. What is the semantic meaning that link refers to in web? Explain about how does Decision Trees help in classification. (2+4)

5. Consider the following documents:

   Doc1 : android linux android

   Doc2 : android android

   Doc3: JAVA Python Python

   Doc4 : Pascal Python JAVA

   Use K-means algorithm with K=2 to make the clusters of given documents. Use Doc1 and Doc3 as initial seeds and use the algorithm for 2 iterations. (6)

6. How does knowledge can be extracted from semantic web? Explain about Resource Description Framework with example. (2+4)

7. How does click analysis help to solve ambiguity problem in search engine? Explain about factors that help to improve the search results. (2+4)

8. Explain about the architecture of recommendation engine. (6)

9. How does clustering differ with classification? How does ROCK work? (2+4)

10. Write short notes on (**any two**): (3+3)
    a) Bagging and Boosting
    b) Damping factor
    c) Web Ontology Language

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Master Level / First Year/ IInd Semester/ Science
Computer Science and Information Technology (CSc. 553)
(Machine learning)

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 carry equal marks.

Attempt all questions.

1. Define machine learning. Differentiate between supervised, unsupervised and reinforcement learning with example.
2. Describe the LMS (least mean square) algorithm and its variations (batch gradient descent and stochastic gradient descent).
3. Describe the concept of overfitting and underfitting. Provide the design concept of locally weighted linear regression (LWR) algorithm.
4. What is exponential family distribution? Show that the Bernoulli and the Gaussian distributions are the examples of exponential family distributions.
5. Provide the suitable example of text classification to describe the terms Naïve Bayes (NB) assumption and explain the Naïve Bayes classifier algorithm.
6. Define Karush-Kuhn-Tucker (KKT) conditions used for Lagrange duality. Explain when the value of the primal problem (p*) is equal to the value of the dual problem (p*).
7. Define the terms training error and generalization error. Explain uniform convergence result using Hoeffding inequality.
8. What is cross validation? Define hold-out cross validation algorithm. Explain the advantage associated with hold-out cross validation algorithm.
9. What is principal component analysis (PCA) model? Explain the relationship between PCA and eigenface method.
10. Write short notes on:
    a. Bias and variance
    b. Sigmoid function
    c. Markov decision processes (MDP)

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Master Level / First Year/ IInd Semester/ Science
Computer Science and Information Technology (CSc. 554)
(Computational Geometry)

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

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

1. What do you mean by self-intersecting polygon? Construct a self-intersecting polygon of a least 8 vertices. Given a polygon, write an algorithm to determine mouths of the polygon. (2+1+3)

2. Construct a layout of more than six segments in 2D space, where at least three of them intersect. Now show how Plane-Sweep method for segment intersection determines the possible intersections. (6)

3. Illustrate turn test is not sufficient to determine point inclusion in a polygon. How ray crossing method can be used to identify inclusion of a point inside polygon? (2+4)

4. Describe how split vertices and regular vertices are handled in plane-sweep algorithm for trapezodaliation? Configure a non-monotone polygon and show the two cases. (6)

5. Define the possible approaches that can be adapted for convex partitioning. How often Hertel's Melhorns algorithm is better for generating the optimal number of convex pieces? (3+3)

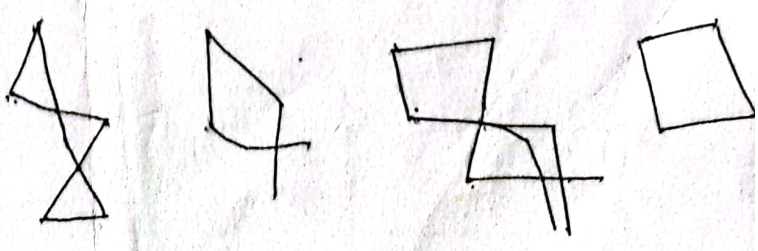
6. Why gift wrap algorithm is known as a output sensitive algorithm? How divide and conquer algorithm can be used for finding the convex hull of given planes in the space. (2+4)

7. Take any five points in the plane and configure a Nearest Neighbor Graph with your own assumption. Given a set of point sites in the plane, what can be the largest empty circle that contains no other point sites inside it. (2+4)

8. Given any two point sets A = {a1, a2, a3} and B={b1, b2}, now copute the Minkowski sum of A and B. How Minkowski Sum can be used for growing the obstacle sets while moving the disc robots? (2+4)

9. What do you mean by range searching problem? How 1-dimentional range searching can be solved using balanced binary search trees? (2+4)

10. When a mesh is said to be valid? How mesh can be generated by geometric decomposition approaches. (1+5)



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Master Level / First Year/ IInd Semester/ Science
Computer Science and Information Technology (CSc. 557)
(System Programming)

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. Write brief answers of following questions. (3x5=15)
   a. Explain instruction formats of SIC/XE (simple instructional computer/extended edition) machine architecture.
   b. Calculate target address for object codes 012060 & 03A030. Assume (B) = 6000, (PC) = 3000, and (X) = 90.
   c. Differentiate between statements "LDA #3" & "LDA = X'03' ".
   d. What is dynamic linking? Describe use and importance of dynamic linking.
   e. Does macro processor use symbol table? If yes, what kinds of variables are stored in symbol table? Explain.

2. Translate (by hand) the following assembly program to SIC/XE object code. Also show all data structures. (10)

Test	START	0
First	LDA	#3
	STX	Three
	LDX	#0
	+LDS	Three
	ADDR	A,X
	+STA	Result,X
Three	RESW	1
Result	RESW	1
	END	First

3. Consider following macro definition. Show expanded macro for the macro invocation "RW F1,F2, 1 " and also show all data structures created in pass1 and pass2 of macroprocessor (5)

RW	MACRO	&ID,&OD, &CV
	IF	(&CV EQ 1)
$IL	TD	=X'&ID'
	JEQ	$IL
	RD	=X'&ID'
	ELSE	
$OL	TD	=X'&OD'
	JEQ	$OL
	WD	=X'&OD'
	MEND	

4. Consider the following BNF grammar, devise token coding for this, and then design finite automata to recognize tokens. Explain any assumptions made in designing automata. Assume that symbol must start from character always and read is reserved word. (5)

<read>→read(<sym_list>

<sym_list>→symbol<sym_list>,symbol

5. Consider following assembly program written for SIC/XE machine architecture and perform following with this: (25)
   a. Generate LOC column and also show all data structures created in pass1. (4)
   b. Generate object code column for the program. (7)
   c. Create Object code file. (4)
   d. Load object code files into memory and show linking process along with data structures used by linking loader. Assume that programs are loaded from memory location 2000 contiguously. (10)

Prog1	START	0
	EXTDEF	A,B
	EXTREF	C,D
R1	LDA	A
R2	+LDA	C+4
A	EQU	*
B	EQU	*
R3	WORD	A-B+C
R4	WORD	C-D-10
	END	

Prog2	START	0
	EXTDEF	C,D
	EXTREF	A,B
R1	+LDA	A
R2	LDT	C+4
C	EQU	*
D	EQU	*
R3	WORD	A-B+C
R4	WORD	C-D-10
	END	

Assume following mnemonic codes: {LDA=00, LDX=04, STX=10, LDS=6C, ADDR=90, STA=0C, LDT=74}

00D
7

00D
7
15

00D
7
151