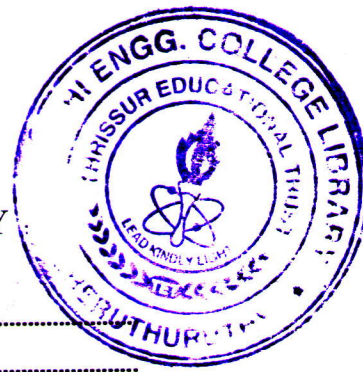


**APJ ABDULKALAM TECHNOLOGICAL UNIVERSITY
08 PALAKKAD CLUSTER**



Q. P. Code : 2A-17-1

(Pages: 3)

Name

Reg. No:

SECOND SEMESTER M.TECH. DEGREE EXAMINATION, April/May 2017

Branch: Computer Science

Specialization: Computer Science and Engg.

08CS 6012 ADVANCED COMPILER DESIGN

(Common to Computer Science and Engineering)

Time: 3 hours

Max. marks: 60

Answer all six questions.

Modules 1 to 6: Part 'a' of each question is compulsory and answer either part 'b' or part 'c' of each question.

Q.no.	Module 1	Marks
1.a	Using SDD for type declarations, draw the dependency graph for the statement <i>int a,b,c.</i>	3
	Answer b or c	
b	Remove left recursion from the following SDT's.	
	i. $E \rightarrow E_1 + T \{ \text{print}(' + '); \}$ $E \rightarrow T$	2
	ii. $T \rightarrow T_1 * F \{ T.val = T_1.val * F.val \}$ $T \rightarrow F \{ T.val = F.val \}$ $F \rightarrow \text{digit} \{ F.val = \text{digit.lexval} \}$	4
c	What changes are to be made to the parser stack to enable implementation of L-attributed SDD during LL parsing? Explain using an example.	6
Q.no.	Module 2	Marks
2.a	Construct the DAG for the expression $((x + y) - ((x + y) * (x - y))) + ((x + y) * (x - y))$	3
	Answer b or c	
b	i. Write down the SDD for translation of array references. ii. Using the SDD, translate and also draw the annotated parse tree for the following statement $x = a[i][j] + b[i][j]$	3
c	i. Justify the use of <i>fall through</i> technique in the translation of boolean expressions. ii. Using this technique translate the following boolean statement. $\text{if } (a == b \ \&\& \ c == d \ \ e == f) \ x == 1$	3

Q.no.	Module 3	Marks
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3.a	What are the various fields in an activation record? Mention their use.	3
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Answer b or c

- | | | |
|---|--|---|
| b | Differentiate between the use of access links and displays for accessing nonlocal data in nested procedures. | 6 |
| c | Discuss the Cheney's copying collector algorithm in detail. | 6 |

Q.no.	Module 4	Marks
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4.a	Draw the DAG for the basic block which consists of the following statements.	3
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a = b + c

b = b - d

c = c + d

e = b + c

Answer b or c

- | | | |
|---|--|---|
| b | i. What are basic blocks? | 1 |
| | ii. Write the algorithm to partition three-address instructions into basic blocks. | 2 |
| | | 3 |

iii. Draw the flow graph for the following

(1) i = 0

(2) n = 10

(3) t₁ = n - 1

(4) if i > t₁ goto (12)

(5) t₂ = i * i

(6) t₃ = 4 * i

(7) t₄ = a[t₃]

(8) t₄ = t₂

(9) t₅ = i + 1

(10) i = t₅

(11) goto (3)

(12) return

c	Compute Ershov numbers for the expression $a/(b+c) - d*(e+f)$ and generate optimal code using	6
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i. two registers

ii. three registers

Q.no.	Module 5	Marks
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5.a	i. Define <i>available expression</i> .	1
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	ii. Write down the iterative algorithm to compute available expressions.	3
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Answer b or c

- | | | |
|----------|--|----------------------|
| b | Explain the principal sources of optimization using the code for quick sort fragment as an example. | 8 |
| c | i. Differentiate region-based analysis from iterative data-flow analysis.
ii. Discuss the algorithm for performing a region-based analysis. | 2
6 |

Q.no.	Module 6	Marks
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6.a Draw the data dependence graph for the following code fragments. Assume a machine with one ALU and one MEM resource. Assume that all operations require one clock, except for the LD which requires two. However, a ST on the same memory location can commence one clock after a LD on that location commences.

- | | | |
|--|--|------------|
| i. | ii. | 2+2 |
| 1) LD R1,a
2) LD R2,b
3) SUB R3, R1, R2
4) ADD R2, R1, R2
5) ST a, R3
6) ST b, R2 | 1) LD R1,a
2) LD R2,b
3) SUB R3,R1,R2
4) ADD R4,R1,R2
5) ST a,R3
6) ST b,R4 | |

Answer b or c

- | | | |
|----------|--|----------------------|
| b | i. How does a basic block scheduling differ from global code scheduling?
ii. Discuss in detail the scheduling of basic blocks | 2
6 |
| c | Elaborate the various constraints that a compiler encounters during code scheduling. | 8 |