

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF APPLIED SCIENCES
COMPUTER SCIENCE DEPARTMENT
DECEMBER EXAMINATIONS 2002

SUBJECT: LANGUAGE FORMALISM & SOFTWARE METHODOLOGY II
CODE: SCS 4103

INSTRUCTION TO CANDIDATES

Answer any 5 questions.
 Each question carries 20 marks

Time: 3 hours

QUESTION ONE

- a) Distinguish between compilers and interpreters. [4]
- b) Outline briefly the advantages of high level languages over machine language. [6]
- c) Describe storage management with reference to the following:
 - i. Static storage allocation
 - ii. Dynamic storage allocation
- d) With an example, explain the term "Macro". [4]

QUESTION TWO

Write a machine language program for computing values of the expression:

$$\frac{a^3}{b^2} + \frac{c^3 + d}{b^2}$$

Using the instruction given below. Also for values of $a=4$, $b=2$, $c=5$ and $d=3$, show the data storage, temporary results storage and the final result.

Give Instruction set: 4 bits	0	0	0	0	-	-	-	-	-	-	Data
	0	0	0	1	-	-	-	-	-	-	Read
	0	0	1	0	-	-	-	-	-	-	Write
	0	0	1	1	-	-	-	-	-	-	Move
	0	1	0	0	-	-	-	-	-	-	Store
	0	1	0	1	-	-	-	-	-	-	Add
	0	1	1	0	-	-	-	-	-	-	Subtract
	0	1	1	1	-	-	-	-	-	-	Multiply
	1	0	0	0	-	-	-	-	-	-	Divide
	1	0	0	1	-	-	-	-	-	-	Exponential
	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-
	1	1	1	1	-	-	-	-	-	-	End.

[20]

QUESTION THREE

The general form of machine M is (Q, E, d, q, F)

- (a) Explain the terms in the brackets [10]
 (b) The formal description of machine M is:
 $((\{q_1, q_2, q_3, q_4, q_5\}, \{0, 1\}, d, q_1, \{q_5\})$
 where d is given by

State	Input	
	0	1
q_1	q_2	q_3
q_2	q_2	q_4
q_3	q_2	q_3
q_4	q_2	q_5
q_5	q_2	q_4

- (i) Draw the state diagram and give the name of the state when the following are the input strings:
 (a) 0 1 0 1 0 1 1 0 0
 (b) 0 1 1 1 0 1 0 1 1
 (c) 1 0 1 0 0 0 1 1 0

[10]

QUESTION FOUR

For the regular expression $(0/1)^*011$, construct an NFA and then develop a DFA using the transition table. [20]

QUESTION FIVE

- a) Considering the following grammar:

$$| E * E | (E) | -E | E \uparrow E | 1d | E | E |$$

Demonstrate, with a table, how the shift-reduce parser will react, when the input string is:

$$\frac{(1d_1 \uparrow 1d_2 - 1d_3)}{1d_4 + 1d_5}$$

[15]

- b) State the four actions that a shift-reduce parser can make.

[5]

QUESTION SIX

Explain how a Non Finite Deterministic Automata can be converted to finite deterministic automata. [20]

QUESTION SEVEN

- a) For the assignment statement
 $x=(r*d)+(c*d)/(-y*-z)$
- i. Draw the syntax tree [4]
 - ii. Give the two types of representations for the syntax tree [6]
- b) Define a programming language according to its
- i. Syntax [5]
 - ii. Semantics [3]
- c) With the aid of examples, define the term 'token'. [2]

END OF QUESTION PAPER