Department of Computer Science & Information Technology
University of Balochistan

Compiler Construction
BSCS (Self finance: 2017-2021)

Year: 2021

Maximum Marks: 70

INSTRUCTIONS
1. Do not write anything on the question paper
2. Use of mobile phones or any communicating device is not allowed in the examination room
3. Attempt any five questions

Question No.1: What are translators; write a detail note on the main types of translators.

Question No.2: What is regular expression. Construct the regular expressions for the following languages defined over the $\Sigma = \{ a , b \}$, defining:
1. All strings with odd number of a's and odd numbers of b's. *For instance: abbaabbb, baaa, aabbbbbbabbaa.*
2. All strings that do not end with 'ba'.
3. All string in which every 'b' (if any) must be followed by at most 3 b's

Question No.3: What is finite automaton; Construct the finite automata for the following languages defined over the $\Sigma = \{ a , b \}$, defining:
1. All strings with at least 3 a's and at most 5 b's.
2. All string with exactly one 'aa' and one 'bb'. For instance: bababaababba, aabb, bbbabaa.

Question No. 4: Write down a detailed note on the main phases of the compiler.

Question No. 5: What is context-free grammar. Construct the context-free grammars for the following languages defined over the $\Sigma = \{ a , b \}$, defining:
1. All strings with equal numbers of a's and b's. For instance: bbabaa, bbaaab, aaaaabbbbbba, aabb.
2. All strings with unequal numbers of a's and b's. For instance: abbabaa, bbaaabaa, baaaaabbbbbbab, baabb, a, bb.

Question No.6: Do as directed:
1. What are 3-tuple notations; convert the following expression into 3 tuple notations
   i) a = b * 25 / 67 – 45 + 80
   ii) c = d * -8 + 100 * 30
   iii) b = (25 + 11) * -5 / 56
2. Write an invalid program in a way that it should contains 2 lexical errors, three syntax errors and three semantic errors. Highlight each type of error which particular symbol/notation.

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Section I
(Compulsory)

Question One Marks (10)

Carefully read the following code, and identify the type and location of different error within a program.

```
#include<stdio.h>
int main()
{
 int a,b,c, sum, av;
 float d;
 printf("Please enter 3 numbers");
 scanf("%d"%d"%d",&a,&b,&c);
 sum=a+b+c;
 d=(a+b+c)/3;
 printf("\nSum is %d", sum);
 printf("\nAverage is %f",d);
 return 0;
}
```

Section II
(Attempt any four questions from this section)

Question Two

What is Compiler? Write a detail note on its main pflase; also describe literal table in detail.

Question Three

What is Code optimization; Describe its main type; also describe why the code optimizer is an optional phase of a compiler.

Question Four

What is syntax analyzer; define and differentiate top-down parser and bottom-up parsers.

Question Five

Convert the following regular expression in equivalent finite state automata:

$((ba^*b + ab^*b)b^* +)^*$

Question Six

What is the central idea of first-end and back-end in the construction of compiler; Describe their benefits and limits.

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Compiler Construction

BSCS (2016-20: Evening): Mid Term Examination

Year: 2019 **Maximum Time**: 1 Hour

Maximum Marks: 30

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Question No. 1: Do As Directed:

1. Write an **incorrect program** of C/C++/Java in a way that program must contain three lexical, three syntax and four semantic errors. Mark the errors in a program in following way:

   (type of error)

   whale (a <= 50)

2. Convert the following expressions into three-tuple notations. Also construct the assembly language code for the generated expressions.
   a. D= 10+ (-25 / 9 + 8) – 2
   b. C = 5 / 2 * 9 / 4

Question No. 2: What are translators; Write a detail note on the main phases of compiler.

Question No. 3: Construct finite automata defined over the ∑ = {a , b}, for the following languages.

I. All strings that contain at most three a's and at most fours b's.
II. All strings with odd a's and odd number of b's.

Question No. 4: Construct the regular expressions defined over the ∑ = {a , b}, for the following languages.

I. All strings with same first and last letters
II. All strings in which the number of a's are divisible by four.

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BSCS (Self Finance)

Year: 2019

Maximum Time: 1½Hour

Maximum Marks: 40

INSTRUCTIONS

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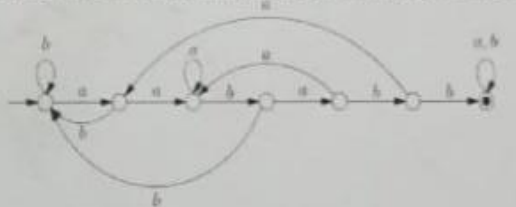
3. Attempt Any Four Questions

Question No. 1: Define compiler; Write a comprehensive note on the phases of the compilers.
Question No. 2: Consider the following parsing table and verify the syntax of given input string.

Non-terminals	INPUT SYMBOLS							
	ID	+	-	*		(	)	$
e	te'					te'		
e'		+te'	-te'				ε	ε
t	ft'					ft'		
t'		ε	ε	*ft'	ft'		ε	ε
f	ID					(e)		

Input String: ID / (ID * ID)

Question No. 3: Convert the following finite automaton into an equivalent regular expression



Question No. 4: Construct finite automata and regular expression defined over the ∑ = {a , b}, for the language containing at least one 'aa' and without any 'bb'

Question No. 5: Attempt both of the following

I. Write a very brief note on the main classes of translators

II. Consider the following grammar and construct the parse tree of the given expression:

<expr> → <expr> + <term>
<expr> → <expr> - <term>
<expr> → <term>
<term> → <term> * <factor>
<term> → <term> / <factor>
<term> → <factor>
<factor> → (<expr>)
<factor> → ID

Expression: (ID * ID + ID – ID) / ID - ID

1 ( )
2 *
3 /
4 +
5 –

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