Roll Number: _____

Thapar Institute of Engineering and Technology
Department of Computer Science and Engineering

B.E. COE: Semester-VII Auxiliary Examination **Course Code: UCS 802**
Course Name: Compiler Construction
August 20, 2024 at 5:30 PM **Name of Faculty: Geeta Kasana**
Time: 3 Hours M. Marks: 100

Note: Attempt all questions with ***proper Justification***. Assume missing data, if any, suitably.

<table>
<tr><td>Q1</td><td>Convert the regular expression $r = (01(0 + 1))^*$ into NFA using Thompson's construction and convert the obtained into DFA using the subset construction method</td><td>10</td></tr>
<tr><td>Q2</td><td>Consider the given grammar $S \rightarrow aSb|\epsilon$
a) Construct LR(1) items for the given grammar.
b) Construct the action and goto tables for LR(1) and LALR(1).
c) Show the error detection for the string "aab" using LR(1) and LALR(1) tables.</td><td>2+5+3</td></tr>
<tr><td>Q3</td><td>Construct Syntax tree and Directed acyclic graph (DAG) for a+b*c-d/(b*c).</td><td>10</td></tr>
<tr><td>Q4</td><td>Discuss the various Error techniques used at the first three phases of the compiler.</td><td>10</td></tr>
<tr><td>Q5</td><td>Write the Quadruples, Triples, and Indirect triples for the expression given below:
(a+b)*(c+d)-(a+bc).</td><td>10</td></tr>
<tr><td>Q6</td><td>Explain various code optimization techniques with the help of suitable examples.</td><td>10</td></tr>
<tr><td>Q7</td><td>Discuss the comparison among Static, Stack, and Heap Allocation with their merits and limitations. Give suitable examples.</td><td>10</td></tr>
<tr><td>Q8</td><td>Consider the following CFG with semantic rules
<table>
<tr><td>$decl \rightarrow type\ var - list$</td><td>$var - list.dtype = type.dtype$</td></tr>
<tr><td>$type \rightarrow int$</td><td>$type.dtype = integer$</td></tr>
<tr><td>$type \rightarrow float$</td><td>$type.dtype = real$</td></tr>
<tr><td>$var - list_1 \rightarrow id, var - list_2$</td><td>$id.dtype = var - list_1.dtype$
$var - list_2.dtype = var - list_1.dtype$</td></tr>
<tr><td>$var - list \rightarrow id$</td><td>$id.dtype = var - list.dtype$</td></tr>
</table>
Draw the parse tree for the string "float x , y" showing the dtype attribute as specified by the attribute grammar.</td><td>10</td></tr>
<tr><td>Q9</td><td>Using suitable examples, differentiate between
i) Synthesized and Inherited attributes
ii) LL and LR</td><td>10</td></tr>
</table>

P.T.O

Q10

10

Draw possible organization (in stack form) for the run time environment of the following function code:

```
int z = 2;
void h(int);
void g(int);
void f(int);
int main()
{
        g(z);
        return 0;
}
void f(int n)
{
        static int x = 1;
        g(n);
        x--;
}
void h(int p)
{
        static int x = 1;
        g(p);
        x--;
}
```

```
void g(int m)
{
        int y = m - 1;
        if(y ≥ 1)
        {
                f(y);
                z--;
                g(y);
        }
        else if (y ≥ 0 && y < 1)
        {
                h(y);
                z--;
                g(y);
        }
}
```

********** All The Best**********