## INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR

## **Department of Computer Science and Engineering**

Sub No: CS31003 Subject Name: Compilers 3<sup>rd</sup> Year B. Tech
Class Test 2

Date: Nov 4, 2024 Time: 6:00pm – 7:00pm Maximum Mark	s: 40
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Roll Number :	Name:	

## [ Answer all the questions. Take and state suitable assumptions, if needed. ]

1. Consider the following grammar (start symbol: based\_num) which generates strings of octal and decimal integers (non-negative only).

Here, we plan to develop a Syntax-Directed Definition which can evaluate the numerical values of the generated strings (with appropriate base). For instance, the string **d237** evaluates as 237, whereas the string **o237** evaluates to 159. In order to solve this problem, we define one inherited attribute *base* for the nonterminals **basechar**, **digit**, and **num**, and one synthesized attribute *val* for the nonterminals **num**, **digit**, and **based\_num**. For syntactically valid but semantically invalid strings (like **o956**), we use a special value called **ERROR**.

basechar  $\rightarrow$  o { basechar.base = \_\_\_\_} } basechar  $\rightarrow$  d { basechar.base = 10 }

 $num \rightarrow digit$ 

 $num \rightarrow num_1 \text{ digit} \qquad \{ \text{ num.val} = \underline{\hspace{1cm}}$ 

num1.\_\_\_\_=

digit.\_\_\_\_ = \_\_\_\_ }

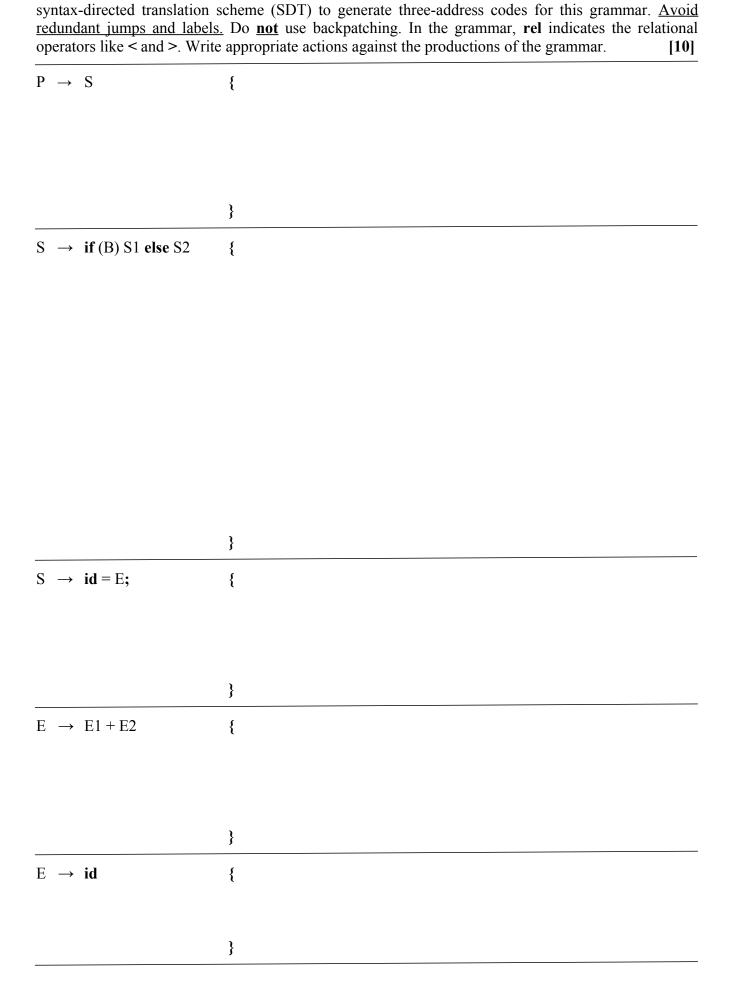
{ num.\_\_\_\_=

digit.\_\_\_\_ = \_\_\_\_

 $digit \to 0 |1|2|3|4|5|6|7|8|9 \qquad \{ digit.val = \underline{\hspace{1cm}}$ 

\_\_\_\_\_

(b) For the two strings d297 and o956, construct and annotate the parse trees using the	[4 + 4]



2. (a) The following grammar generates boolean expressions and conditional statements. Design a

 $B \rightarrow E1$  rel E2{ }  $B \rightarrow (B)$ { } B → B1 && B2 { }  $B \ \rightarrow \ B1 \parallel B2$ { }

**(b)** Apply the SDT of Part (a) to translate the following statement to a three-address code. In this process, suitably annotate the relevant parse tree. [15]

```
if (a > b && (c < d || p > 100))
    x = 0;
else
    x = 1;
```