Roll Number:_____

Thapar Institute of Engineering and Technology, Patiala

Computer Science and Engineering Department

AUXILIARY EXAMINATION

B. E. (Final Year): Mar 2018 (2017/18)	Course Code: **UCS802** Course Name: Compiler Construction
March 05, 2018	Monday, 17.30 – 20.30 Hrs
Time: 3 Hours, M. Marks: 100	Name Of Faculty: Karun Verma

Note: Attempt all the questions. Attempt parts of one question in sequence. Draw neat diagrams wherever required. Pencil should only be used to draw diagrams. Assume any missing data. Use of calculator is strictly not allowed.

Q1. Consider the following Context-Free Grammar $G = \{\{S, A\}, S, \{a, b, c, d\}, P\}$, (20)
where P is set of productions having elements:

$S \rightarrow Aa$
$S \rightarrow bAc$
$S \rightarrow dc$
$S \rightarrow bda$
$A \rightarrow d$

Show that this grammar is LALR(1), but not SLR.

Q2. Consider the following Context-Free Grammar
$G = \{E, \{E, T, F, M, A\}, \{+, -, \times, \div, id, (,)\}, \text{P}\}$ where P is set of productions as

$E \rightarrow E\ M\ T \mid T$
$T \rightarrow T\ A\ F \mid F$
$F \rightarrow id \mid (E)$
$M \rightarrow \times \mid \div$
$A \rightarrow + \mid -$

a. Compute the FIRST sets for all sentential and grammar symbols 5
b. Compute FOLLOW sets for all Non-Terminals of grammar. 5
c. Generate the parsing table for LL(1) parser. Is G defined above a LL(1) grammar? Justify 5
d. Parse the following string $id_1 \times id_2 + id_4 \div (id_4 - id_5)$ 5

Q3. a. Represent $k = -(a - b) + (c * -x)/(a - y)$; in the form of triples and quadruples. 10

b. Consider the following grammar $G = \{\{S, W, X, Y, Z\}, S, \{a, b, c, h, m, n\}, P\}$, 10
where P is set of productions having elements

$S \rightarrow aWXh$
$W \rightarrow Wb \mid c$
$X \rightarrow YZ$
$Y \rightarrow m \mid \varepsilon$
$Z \rightarrow n \mid \varepsilon$

Eliminate left recursion and Left factor the above grammar.

Q4. a. What is activation tree? Explain various units of activation tree. Draw the activation tree for: 3+2+5

```
...
printf("Enter Your Name: ");
scanf("%s", username);
show_data(username);
printf("Press any key to continue...");
...
int show_data(char *user)
  {
  printf("Your name is %s", username);
  return 0;
  }
...
```

b. Differentiate between (citing suitable examples) 10

i) Synthesized and Inherited attributes

ii) Dependency graph and Annotated Parse tree

Q5. a. Consider the following Context free grammar for signed binary numbers as $G = \{\{N, S, L, B\}, N, \{+, -, 0, 1\}, P\}$, where P is set of productions having elements: 15

$N \rightarrow S\ L$

$S \rightarrow + \mid -$

$L \rightarrow B \mid L\ B$

$B \rightarrow 0 \mid 1$

Let val, neg be synthesized attributes, and pos be an inherited attribute for the above grammar. Create a translation scheme to calculate the value of signed binary number.

b. Using the translation scheme for the above grammar, parse and evaluate the following signed binary number: -101011. 5