

CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY

Seventh Semester of B. Tech (CE) Examination
November 2022

CE442 Design of Language Processors

Date: 21.11.2022, Monday

Time: 01.30 p.m. To 04.30 p.m.

Maximum Marks: 70

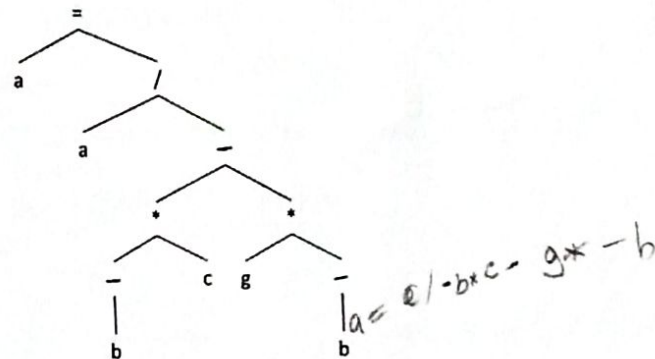
Instructions:

1. The question paper comprises two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.

SECTION - I

Q - 1 Answer the following questions.

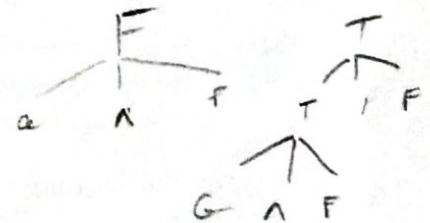
- (A) How scope information is managed by symbol table? [01]
 (B) Mapping of name with storage is called _____. [01]
 (C) Construct a DAG for the given syntax tree. [02]



- (D) Construct the annotated parse tree for the given input string using given SDD. [03]
 Input string : $b \wedge (a / 5)$ (Consider value of $a = 15$ and $b = 10$)

SDD :

Grammar Rule	Semantic Rule
$T \rightarrow T * F$	$T.val = T.val * F.val$
$T \rightarrow T / F$	$T.val = T.val / F.val$
$T \rightarrow F$	$T.val = F.val$
$F \rightarrow G \wedge F$	$F.val = G.val \wedge F.val$
$F \rightarrow G$	$F.val = G.val$
$G \rightarrow (T)$	$G.val = T.val$
$G \rightarrow id$	$G.val = id.lval$
$G \rightarrow const$	$G.val = const.lval$



- (E) Consider the below given code. Construct the activation tree and show the content of control stack, if subroutine sub() is in execution. [04]

void main()	fun()	mul()	div()	add()	sub()
{	{	{	{	{	{
...
fun()	mul()	add()	sub()	}	}
...		
}	div()	}	}		
	}				

Q-2 Answer the following questions. [ANY THREE]

[12]

- (A) Design an SDD to count 0's in binary number.
 (B) Construct the three address code for the below given statement. Also represent the generated three address code using triple.
 $a = b + c / 30 * (g - h)$
 (C) Explain symbol table implementation using hash table.
 (D) List issues in the design of a code generator.

Q-3 (A) Below given assembly code is given as an input to one pass assembler. Show the content of data structures constructed by the assembler. Consider the OPTAB given. [06]

```

B      START      5041
      MOVER      AX, = '6'
      LTORG
      ADD        AX, A
      MOVEM      AX, F
      ORIGIN     B - 5
      STOP
F      DS        2
A      DC        '8'
      END
  
```

OPTAB

STOP	IS	(00,1)	READ	IS	(09,1)
ADD	IS	(01,1)	PRINT	IS	(10,1)
SUB	IS	(02,1)	DS	DL	R#
MULT	IS	(03,1)	DC	DL	R#
MOVER	IS	(04,1)	START	AD	R#
MOVEM	IS	(05,1)	END	AD	R#
COMP	IS	(06,1)	ORIGIN	AD	R#
BC	IS	(07,1)	EQU	AD	R#
DIV	IS	(08,1)	LTORG	AD	R#

OR

Q-3 (A) Consider the below given C code. This program is passed to macro processor. Write the expanded C code generated by macro processor. [06]

```

#define s scanf
#define p printf
#define fun(x,y) x>y?fact(x),y
#define fact(t) (t/2)
void main( )
{
    int a, b ;
    s("%d",&a);
    b = fun(a,20);
    p("%d",b);
}
  
```


Q - 3 (B) Write a note on below topics.

[04]

- 1) Absolute loader
- 2) Bootstrap loader

OR

Q - 3 (B) List the types of language processors. Analyze the below given two cases and identify which language processor used in those case. [04]

- 1) convert java code to C++ code
- 2) convert 8086 assembly code to machine code

Q - 3 (C) Construct the control flow graph for the given three address code. [02]

- 1) $f = 1;$
- 2) $i = 2;$
- 3) if ($i > x$) goto (9)
- 4) $t1 = f * i;$
- 5) $f = t1;$
- 6) $t2 = i + 1;$
- 7) $i = t2;$
- 8) goto (3)
- 9) $z = f$

SECTION - II

Q - 4 Answer the following questions.

(A) "Peep-hole optimization is applied to small part of the code and applied repeatedly." [01]
Is the statement true or false?

(B) Eliminate the left recursion from the below given grammar. [03]

$X \rightarrow XYd \mid Xa \mid a$

$Y \rightarrow Ye \mid bZ$

$Z \rightarrow g \mid h$

$A \rightarrow A \alpha \mid \beta$

$A \rightarrow \beta A^i$

$A \rightarrow \alpha n \mid \beta$

(C) Design a DFA which only accept the strings over 1 and 0 start and end with same symbol. [03]

(D) Explain reduction in strength and dead code elimination in terms of code optimization. [04]

Q - 5 Answer the following questions. [ANY FOUR]

[12]

(A) Consider the below given code. Which memory allocation will be done for variables a, b and c?

```
int a;
void main( )
{
    char *b;
    ...
    b = (char*)malloc(10*sizeof(char));
    ...
    fun();
}
```

```
fun()
{
    static int c;
    ...
}
```

(B) Prove that below given grammar is ambiguous grammar.

$S \rightarrow AB \mid C$

$A \rightarrow aAb \mid ab$

$B \rightarrow cBd \mid cd$

$C \rightarrow aCd \mid aDd$

$D \rightarrow bDc \mid bc$

- (C) Describe the use of buffer pairs in lexical analyzer. *gappa baki 6.*
- (D) Find the follow set for all non-terminal symbols of the below given grammar. *gappa baki*
- $S \rightarrow tABCD$
- $A \rightarrow qt | t$
- $B \rightarrow r | \epsilon$
- $C \rightarrow q | \epsilon$
- $D \rightarrow p$
- (E) Explain handle and handle pruning in terms of parsing.

Q - 6 Answer the following questions. [ANY TWO]

[12]

- (A) Construct the predictive parsing table for the given grammar. Check given grammar is LL(1) or not by analyzing the table.
- $S \rightarrow i E t S N | a$
- $N \rightarrow \epsilon S | \epsilon$
- $E \rightarrow b$
- (B) Generate the LR(0) item set for the given grammar.
- $S \rightarrow Aa | bAc | Bc | bBa$
- $A \rightarrow d$
- $B \rightarrow d$
- (C) Construct the NFA for the given grammar using Thompson Construction.
- $(a a^* | b b^*) c d \#$
- (D) Compute the operator precedence relation graph and precedence relation table for given grammar.
- $T \rightarrow T + F | F$
- $F \rightarrow (T) | id$
