VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.



LAB REPORT on

Compiler Design

Submitted by

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in partial fulfillment for the award of the degree of BACHELOR OF ENGINEERING in COMPUTER SCIENCE AND ENGINEERING



B.M.S. COLLEGE OF ENGINEERING
(Autonomous Institution under VTU)
BENGALURU-560019
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(Affiliated To Visvesvaraya Technological University, Belgaum)

Department of Computer Science and Engineering



CERTIFICATE

This is to certify that the Lab work entitled "Compiler Design" carried out by KEERTHI P REDDY (1BM21CS090), who is bonafide student of B.M.S. College of Engineering. It is in partial fulfillment for the award of Bachelor of Engineering in Computer Science and Engineering of the Visvesvaraya Technological University, Belgaum during the academic semester June-2023 to Sep-2023. The Lab report has been approved as it satisfies the academic requirements in respect of a Compiler Design(22CS5PCCPD) work prescribed for the said degree.

Sunayna S Dr. Jyothi S Nayak

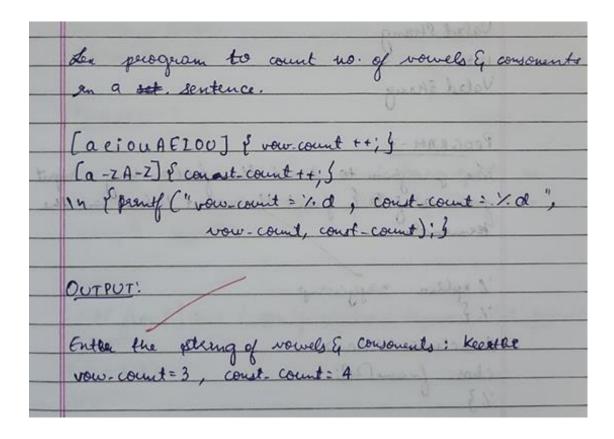
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<u>Part-A: Implementation of Lexical Analyzer, By using C/C++/Java/Python language and using LEX tool.</u>

Program 1:



Output:

Enter the string of vowels and consonents: KEERTHI vow_count: 3 , const_count: 4

Program 2:

Lea program to good be look
from a fele & prent the valed taken on the
from a fell a print the valed token on the
termenal.
V. oplian nagywrap
" S aggurap
1. {
anclude (stdro.n)
10. 1 5.3
y, 3 frams (20);
\(\frac{1}{2}\)
cont [floot char & grent (" keywords: "/s \n", ygtest); } (0-9] * & print ("number: "/s \n", ygtest); } (a-2A-Z) * & print ("character: "/s \n", yytest); } X'/.
[0-9]* of psz HC"
Cara 77 x is member: "1 s \n", yestext);
(character: " sin" yytest)
17.7.
vord mon()
vord mon()
vord mon()
vord mon()
prents (" Giter the fale name!"); sconf (" Y. S", Juame); yyen = fopen (frame, " x");
vord mon()
prents (" Giter the fale name!"); sconf (" Y. S", Juame); yyen = fopen (frame, " x");
prentf(" buter the fale name!"); sconf (" Y. S", fname); yyen = fopen (fname, " x"); (gglex (); flow (; flow (yyen);
prents (" Giter the fale name!"); sconf (" Y. S", Juame); yyen = fopen (frame, " x");
pernt/(" Giter the fale name!"); sconf ("'Y. S", finame); ygen = fopen (finame, " x"); yglex (); flow-(; fclore (yeyen);
prentf(" Enter the fale name!"); sconf ("'Y'. S", fname); yyen = fopen (fname, " x"); yyelex O; floor 5; fclore (yyen); y Output:
proof man() proof (" Giter the fale name!"); sconf (" Y. S", fname); yyen = fopen (fname, " x"); yglex (); flow b; flow (yyen); They the fale name: P-txt
vold man() sprentf(" beter the fale name!"); sconf (" 1.5", fname); y yen = fopen (fname, " x"); (yelex O; floor-5; fclose (yeyen); beywords: floot beywords: floot
proof man() proof (" Giter the fale name!"); sconf (" Y. S", fname); yyen = fopen (fname, " x"); yglex (); flow b; flow (yyen); They the fale name: P-txt

```
enter the input file name
input.txt
enter the output file name
output.txt
```

1 int a,b;

int Keywords a Identifiers, Seperatorb Identifiers; Seperator

Program 3:

```
tex perogram to recognize floating point no is
^[+-]?[0-9]*[0-9]+& prentf(" Hoating point no.");}
^[+-]?[0-9]* & prentf("Not a valid floating
point no.");}
OUTPUT!
 4.5
 floating point
 Not a valid floating point no.
+3.89
Hoating point no.
- 3.89
Hooling point no
 . 44
 Hoating point no
 44.
 Not a valed floating point no.
```

Output:

```
Enter the number: 5
Not Floating point no.
.6
Floating point no.
7.8
Floating point no.
```

Program 4:

```
> write a LEX program that copies a fele,
 replacing each non empty sequence
  whete spaces by a stength blank
  X. 8
  # enclude (8+dro.h) & O govern
  # enclude (strang. h) Int
  # enclude ( & tollab. h.
  chox 84:1[200]; (8=1,000);
  7.4
  7.7
   [In] & fprintf ( ggout " 1.8 In ", stil); stilo]=1
   [ ] * { fprint ( gyout , " /s", str 1; st 1(0) = 10")
          formity (cycout " " s ", str 1)
          shoot (sh 1, yytest):
  ((EOF)) { front (yyour, " 1.5", st. 14);
       getwen o'
  7.4
```

```
ent mom ()
   extern FILE * yyen, * yyoud
   chor felename (100);
prihtf (" fiter name of fale to copy; \t");
sconf (" Y.S", falename);
    gegen: fogen (felenome, " x");
         enet (0);
   Sconf(" Y.S", felename);

yyout = fopen (felename, "w");

ef (yyout = > NULL)
      exet(1);
   gylen ();
 end yy wrop ( vora)
```

Open ~	₽	~/D	input.txt esktop/CD LAB/Lab Programs
1 this is	a sample	text for	the program

Program 5:

```
wat a les program to encognize the following
   takens over the alphabets &0,1, .... 93
 a. The set of all examps ending in oo
   7.7.
  [0-9] * 00 & prents (" sterning accepted"): 9
   ent gywap()
   ent man ()
    gylen ();
  DUTPUT:
  des string-end. 00. 1
  ce lexyy.
  . /a. out
  1 010 0
  Strong accepted
  34 560
  strong rejected.
b. The set of all strings with 3 consecutive
  7.7.
  [0-9] * 222 [0-9] * 1 proof (" string contours 222"); }
```

OUTPUT:	14
OUTPUT:	
11.34	2000
Sking downot contain 222.	47, 1
The same of the sa	integral
C. The set of all strong such the	at sever. Idah
c. The set of all strong such the of fine consecutive symbols can two 5's.	tains of but
two 5's.	at nost
	1/1/2
2%	1
(Co +] *	1.500
S	1
ent inco:	1
ef (yyleng < 5)	
2000	
partitle 1/25 days	the section of
2 paratel " 1.5 dosnit mate	any much
oes.	yy had
else s	
fa (1:0; 1 (5;1++)	X X
ed last est and last and last and	11 - 1 - 1
1000 400 (17 - 10)	1.1.1
28 99	93.9.5
C44'	- Gulera
	(4)
21((222))	
58	20.00
	*1
(you () < yying ; 1++)	-Turned
*	

of (yestent [i] = '5') & c --; 9

of (yestent [i] = '5') & c ++; 3 printy (" 1.5 doesn't match any sucle in', yet y. y. d. The set of all strings beginning with a which, enterpreted as the benary representation of an integer is congruent to zero module 5 y. y. (1 (0)*(11 |01)(01 * 01 | 01 * 10 (0)* (11 |)* 0) (1/10/0)+ (1/01)(01+01/00+10(0)*(1/1)+10 pring (" The set of all strongs beginning with as es interpolated as the bruary supresentation of an enterger "J;

e. The set of cell strings such that the 10th symbol from from the night and est 7.7. (fay) x 1 fay fay f protest (" The set of all strongs such that the 10th symbol from the sight end so 1"); 7.4 DUTPUT 0160011101 The set of all string such that the 10th symbol from right and est. f. The set of all a digital us is whose anderednot degets are in ascending order from left to argu. \$ d3 545 at sum = 9,7; for (1= 0; i(4; i++) sum = sum + yytent (i) - 48; of Coun : : a) 2 print (" The sum of degety whose sum to 9")

1 Sall and All party Hall to the
5
7. y,
0234
0234
The sum 20 9.
The transfer and the sale
g. The set of all 4 deget now whose andereduce degets one an ascending order from left to englit:
draws are a size of a size and he
Sealet:
7. 7.
Sassuys
7257097
for (i=0; 1 (3; 1++)
ef (gytent [i] > gytent [4~])
20 33 39 39 (# - D)
Site of
Sum = 0°, break; g
/ 1000000000000000000000000000000000000
9
of (sum = =1)
7
provol (" and sole
3 pring (" ascending order from left town
else
7
I provide (" " s doesn't wasten any rule be
1 3
7. 7.
The state of the s
00107: 4 5 6 7
In ascerding order.
11 3023

```
Enter text
1200
1200 -> string ending in 00

122299
122299 -> string with three consecutive 222's

10
10 doesn't match any rule
157495
157495 doesn't match any rule
```

Program 6:

```
WARP to design a lenical Analysis to excepting
any 5 ley words, identifiers, no 's , operators &
# mclude (Stdto h7
# andudes chype h)
# melude < string.h?
# defene KEYWORD 1
# defense IDENTIFIER 2
# defene NUMBER 3
# dyne OPERATOR 4
#defane PUNCTUATION S
#define INVALID 6
but be rebuguered (chos * str)
    aut i;
    char key words (57(10) - 5" of ", "else", "while", " mit
    for (100; 145; ++1)
          of (stromp (8th, beywood (;1): =0)
              seturn KEYWORD;
    return 0;
```

-	Frige No:
	word analyze Total char * token)
	P. C.
	At (askeyword (token)= = K FYWORD)
	of (askeyword (token) = = k EVWORD)
10	proht/ ("KEYWORD: YS \n", foken).
	y pronty (" KEYWORD: YS In", token);
19	
	else of (as droget (token CoD))
	genof (" Number: 1/8 \n "taken).
	genof (" Number: 1. 9 \n ", token);
	else & Casalpha (folem (of) token [o] = - '_')
	else if (asalpha (foken [o]) token [o] = = '_')
	pront ("Op I dentelles: 1.5 (n", taken");
	print ("Op I dentefrer: ". s (n", token");
	slug (otech ("+-+/=", token(OJ) 6=NULL)
	Ş
	printy ("Operator: "/ S \n') token);
	A 13 A D. Lance and
	Selvery
	S T
	prouf (" Invaled John: ". s \n", token);
	3
	3
	ent marks
	2
	chos empet(500);
	chos tokur[100];
	ant token Index "O;
	sent?;

	prints (" Enter the C prooperam code: \"); fget (supert, 8ize (supert), st dan); for (i=0; i (= stelen (supert); ++i)
	Last Carpet. 8920 (mout). et dan).
	Ine (:= 0: : (= okle (mout) : + =:)
	21 (20 Chum (200 t) 11 24 (2) 2 4 4 (1) 21 1)
	of (exalmum (expet) 1) 3 tolan); emput (1)==1_1)
	fals. [tolon 1, b, +] = 2 0,157
	Coken [token Index + +] = an gest [i]:
	else
	§ ·
	of (token Inden 70)
	· ·
	token[token Index] = '10';
	analyze Token (token);
-	analyze Token (token); token Index = 0;
-	9
- 1	of (empet(i) 6= 1 1 leh august(i) != 0'in ble supret [i] (= 1/4")
	ble supert [i] (= 1(+1)
	token (o) = augut (i);
	token[i] = '10';
	analypoken (token).
	4
	e also as
2	Rothern O;

```
DUTPUT
Enter C program code:
 Penetueleon:
```

```
Enter the sentence: int
Keyword
abc
Identifiers
+
Operator
!
Punctuator
123
Constants
```

Part-B: Part-B: Implementation of Parsers (Syntax Analyzers) Using C/C++/Java/Python language)

Program 1:

+	
	PROGRAM 18: Recursive Decent
ł	
	# enclude < st dro. h?
	# rnclude < stolleb.h)
ł	char supert (100);
	ent end=0;
1	vold match (char expected)
ļ	E CONTRACTOR OF THE PARTY OF TH
l	of (supert [trid] = = expected)
	40
	£nd++;
-	A ST A STATE OF THE STATE OF TH
I	3
	word Ac);
ı	word S()
	E A LA L
i	match ('c');
i	A();
i	The state of the s
i	match ('d');
i	The state of the s
	word A()
	£
i	of (enput (ind)== 'a')
	90
	prentf ("Hello In");
	pantf ("Hello In"); match ('a'); match ('b');
	match ('b');
	3

else prenty ("Parsong Forled. In', and); ext (1); ant man () -perenty (" Fixer the super strong: \n"); scanf(" " s ", enget); (suput (and) == ' \$") granf ("Porseng successful. \n"); grenty ("Parsing Falled . Extra charactery found "); seture O' DUT807 1 Enter the emput orlrang: cabo \$ Parseng Successful. Fire the reput strong: caact Parsing Tooled. Fitra character found

```
Enter the input string: cabd
Parsing successful! Input belongs to the given grammar.
```

```
Enter the input string: caab
Parsing failed! Input does not belong to the given grammar.
```

Part-C: Syntax Directed Translation using YACC tool

Program 1:

	Page No:
String match and who	ere in 75
Reguerrance as	
The said the said to	
3.2	
# anchide (stoleoh)	
# enclude (Stdleb.h)	42.2
H mclude "y. tab.h"	
eatern int gylval;	
7.4	
1.7.	in the state of
	extrem 0; }
(aA) fyglval = cyclent [0]; (bb) f cycleol = gytert [0]; In f action No: 9	setum B; 3
In & section N. 19	
Y getween wetent [0] 3	201000
Y action gytest [0]; 3	1-1-01-1
ant yyurap ()	182
t 17	The way done
	9
areturn 1;	T Miller
	to militare
y &	-
# anclude (Stolao. h)	
# anclude & Stollab . A7	1,010
ant yejerror (chas *s);	Miles a color
	0000000
ant wellow toold I	
ent yy (entword);	man harried
Int yy lent voids,	The Same
9	public billion
1. token A 7. token B	puche house

Smta: AAAAA SBB NLP printf ("Passed using the sule (a" b) b n >>5 In Valed String 181). 5: 5 A 7. 7. word main() prontf(" finder a strong ! \n'); yaparse (); ent yyerror (chor * 5) printf (" In voted strong ! ("); return of Roles a strong Parced using the scale (at n) b, n 7:5 valid string qabbb Invalid Strang!

Enter the string: aaaaab\$
Parsed using the rule(a^n)b, n>5
Valid string!

Enter the string: aabb\$ Invalid string!

Program 2:

```
PROGRAM - 19: Desk Calculotes
1 opten norganap
Franchide "y. tab.h"
7.3
[0-a] + Lyylval = atoi(yytext); setuen NOM; 3
[It];
In section 0;
. seturn gytest [0]
7.7.
7.5
# anclude (stdros)
 Y. toben NUM
1. left '+'
 1. etglit 1-1
 enprise of prenty ("Valed enpreseron In");
 prot ( " Result : " d \n", $$ ); suturn 0,5
 e:e '+'e & $$ = $1 + $35
1e'-'e & $$ = $1 - $3;5
 INOM & $ $ = $1 4
 7.7.
ent maen ()
print ("In like an arethmetic expression");
```

possession In Impad expression In "); OUTPUT Enter an anothmethic expression 5+6-3-6 Valled expression Result: 14

Output:

Enter an arithmetic expression: 1+2*3%1^2 Valid expression Result: 1

Program 3:

```
write a Yacc program to generate syntam tree for
a geven authoritic expression
1.5
#enclude < math h)
# enclude ( etype h)
# anclude ( stoleo. h)
# unclude < stallby
# undude ( string . h)
struct tree node
 char valtio];
ent sc;
ent and;
struct tree- no de syn-tree [ 100];
rold my-perut-tree ( aut as- and);
ant menade ( ant 10, ant ac, char val [10]);
13
1. token deget
 S. E & my-prent-tree (11);3
E #: '+'T & $$ = mknode ($1, $3, "+");;}
 1T 5$$ - $1; 5
```

```
T: T'x' F & $ = menode ($1,$3, "+"); 3
1F 15 $$ = $13
F: '('E')' & $$ = $23
I deget & char buf [10]; sport (buf, " "d" you
            $$ = mknode (-1, -1, but); }
7.7.
ent marn ()
  and = 01
  print/(" Enter an expression");
  gyparse ();
  sietury 0;
ent yyeres ()
  potuty (" NITH ELLEY \");
ant menode ( ant de, ant oc, char vallio))
  strong (syn-tree (ind), val, val);
    syn_tree (Ind). lc=
    sign the [rud] ne = rc;
  netwan and -13
```

```
word my-print-tree ( at cur- and)
5
           ( are - and == -1) ketween;
           sign-tree (au- and). le = : - 1 hb sign-tree
                           [ aur - and ]. ac = =
              (" Diget Node -> Index : ".d, value: ".s)
                   curr - and, syn-tee [cur-and ] val);
       portuty ("Operator Node -> Index: 1.d, Value: 15
               left Child Index: 1.d, Right Child Index: 18
               in syn-tree [ cur-and). Ic. syn-tree
                                   [au- ind););
      my print-tee (syn-tree (au - md). ld;
      my-print-free (sym-tree (cur and). rc);
Pl
# michide yy. tab. h"
extern out yelval;
1.4
1.7.
[0-9] + & yelval > ator (yy fext); eveturn deget; }
C+3:
[In] setum 0;
        otetum yylen (0);
ant yywap ()
```

```
Operation Node -> Tenden: 2, Value: +, left Child Se

Operation Node -> Tenden: 2, Value: +, left Child Se

Right Child Index: 1

Orget Node -> Juden: 0, Value & 2

Orget Node -> Juden: 1, Value: 4
```

```
Enter an expression
4+6*9
Operator Node -> Index : 4, Value : +, Left Child Index : 0,Right Child Index : 3
Digit Node -> Index : 0, Value : 4
Operator Node -> Index : 3, Value : *, Left Child Index : 1,Right Child Index : 2
Digit Node -> Index : 1, Value : 6
Digit Node -> Index : 2, Value : 9
```

Program 4:

```
Tufen Postfer
# enclude (stdeo.h)
# ancheded stelle b. h)
# miluded "y.tabh" extern ent yylval;
7.4
7.7.
(0-9)+ Pyylod = ato: (yytext); return num;
       facture 0;3
         & extrem geglent [0]; }
7.7.
ent yywrope)
Tufu Posket
# enclude (Stolao, R)
# anchide < Steles hy
ant yesers (const chos +5);
ant yester (vord);
y. taken num
 7. left '+' '- '
 1. left ' * ' 1'
```

7.7. S: e { printy (" \n"); 3 e: e'+'t *proof("+");3 t: t' * ' h &proof (" + "); 3 It 'I' h fpront (" / "); 3 h: (' 1' h Eprony (" 1");} Epring (" vd , \$1"); 3 1.7. word man () printf(" Enter an ent yugaror (cont char *5)

```
peruf ("Invaled infra exession! In");
exetuen 0;

Gugut!

Exter an infra engression

3+9*8

395*+

The fact of expression

3+9*6/5+

396*5/+ Theolid expression!
```

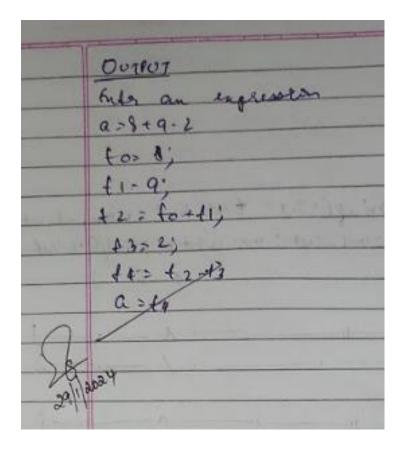
234*+

```
Enter an infix expression:
3+6*2-1/3
362*+13/-
Enter infix expression: 2+3*4
```

Program 5:

```
Addrew Code. 1
    7.5
    # anchule (Stolao. 4)
    # enclude (Stelsteh)
   # enclude & " y lab 43" "
extern ont cyclock;
extern chase iden (20);
   d (0-9)+
   d Ca-z A-ZJ+
   (d) fyefval: ator: (yytest); deget; 3
(a) ( strepy (iden, yytest); gylval:1; rotuenid:
(11) (; 3
   In return 0;
        return gytest (a);
  ent yyerapl)
     return 1;
 Address & Copy y
 # melude ( maty . A)
# mclude (ctype. h)
ant yyerran (char +5);
```

chos Iden (20), 1. folcen id Y. folken alight 7.7 5: 10 ' = ' E {print("7.3 = tild In", 1 den, vol- with E: E'+'T { & 8 : vor - cut : vor - cut ++; printf("4").d , \$83); T: T' +' F & _____ 171F 6 -1F \$ 35 = \$1;3 sut morn () vog.cut=0; print ("Fites an expression: 14); expanse (); ecturo, and yyears (can is) setum 0;



```
Enter an expression:

a=8+9-2

t0 = 8;

t1 = 9;

t2 = t0 + t1;

t3 = 2

t4 = t2 - t3;

a = t4;
```