

**Project Report on
Compiler for
English Sentence Analysis System**

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CERTIFICATE

This is to certify that the project entitled “**Compiler for English Sentence Analysis System**” is a bonafied report of the work carried out by

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of Department of Information Technology, semester VI, under the guidance and supervision for the award of the degree of Bachelor of Technology at Dharmsinh Desai University, Nadiad (Gujarat). They were involved in Project in subject of “**Language Translator**” during academic year 2022-2023.

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GitHub: <https://github.com/Mehul773/English-Sentence-Analysis-System.git>

1.0 INTRODUCTION

1.0.1 Project Details

Language Name: English Sentence Analysis System

Language description:

This language analyzes the grammar of English sentences and identifies the subject, verb, object, and other parts of speech. The input is a sentence in English and the output is the analysis of the sentence in terms of its grammatical structure, including the identification of the subject, verb, object, and other relevant parts of speech.

Input:

"He had been driving car"

Expected output:

subject = He had = had
been = been verb-with-
ing = driving object =
car eos = .

1.0.2 Project Planning

Mehul Chovatiya : Project Idea and YACC file

Meet Dadhania : Finite Automata and Lex file

Manushi Dagli : Documentation

Sanjana Daki : Environment setup

2.0 LEXICAL PHASE DESIGN

2.0.1 Regular Expression:

Keywords :

Token RE

subjecttypeone "He"|"She"|"It"

subjecttypetwo "I" subjecttypethree

"We"|"They"|"You" am "am" is

"is" are "are" have "have"

has "has" had "had" been

"been" was "was" were

"were" willshall "will"|"shall" be

"be"

verb "play"|"smash"|"give"|"feel"|"write"|"watch"|"ask"|"learn"|"begin"|"choose"|"drive"

verbwiths "plays"|"smashes"|"gives"|"feels"|"writes"|"watches"|"asks"|"learns"|"begins"|"chooses"|"drives" verbwithing

"playing"|"smashing"|"giving"|"feeling"|"writing"|"watching"|"asking"|"learning"|"beginning"|"choosing"|"driving"

"played"|"smashed"|"felt"|"Watched"|"asked"|"learned"|"learnt" verbpastandparti

"gave"|"wrote"|"began"|"chose"|"drove" verbpast "given"|"written"|"begun"|"chosen"|"driven"

object "cricket"|"car"|"football"|"teacher"|"anime"|"maths"|"violence"|"glass"|"letter"|"journal"|"dog"|"blessings"|"tension"|"Netflix"|"bike"

Delimiters : { . , and \t \n }

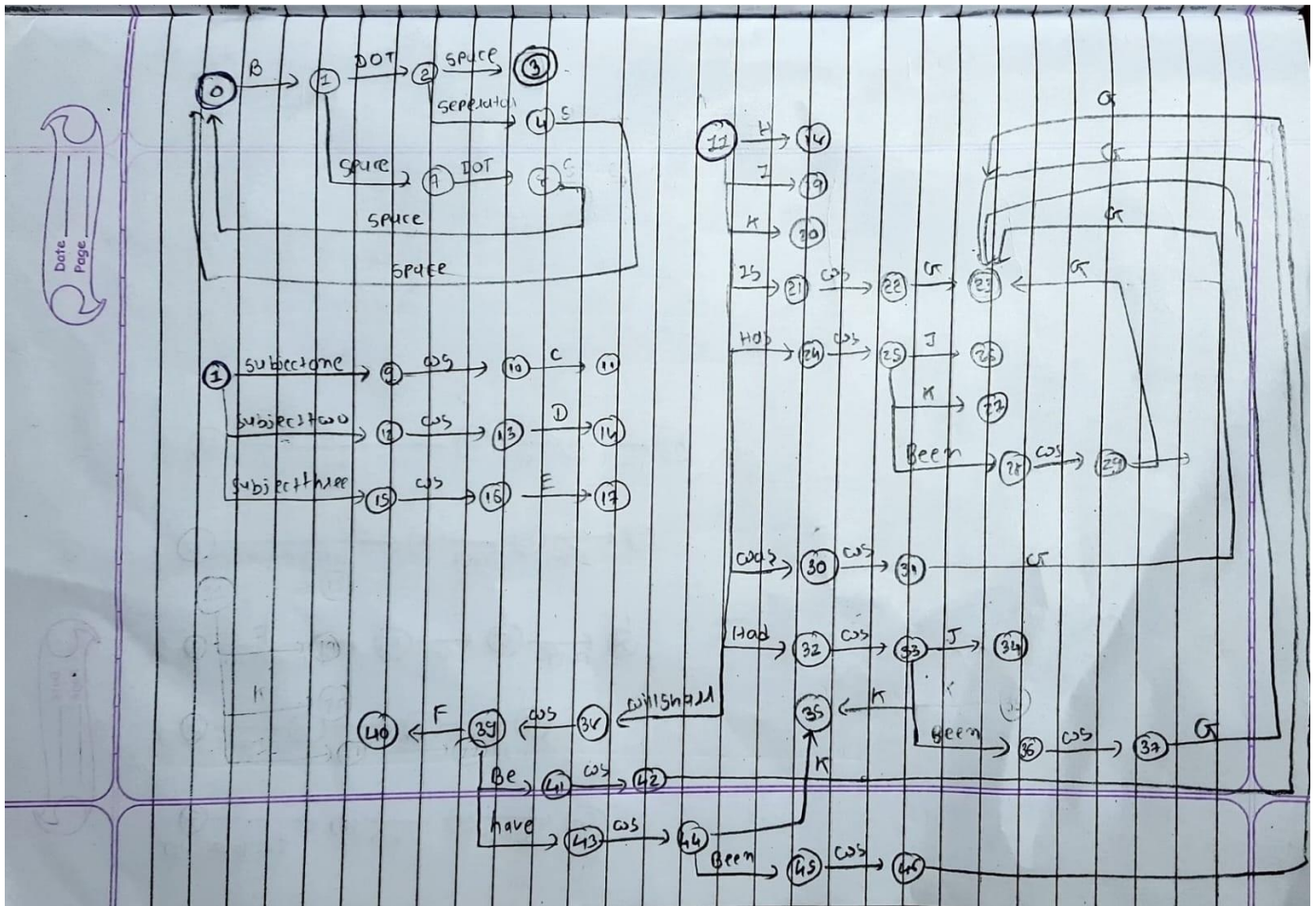
Token RE

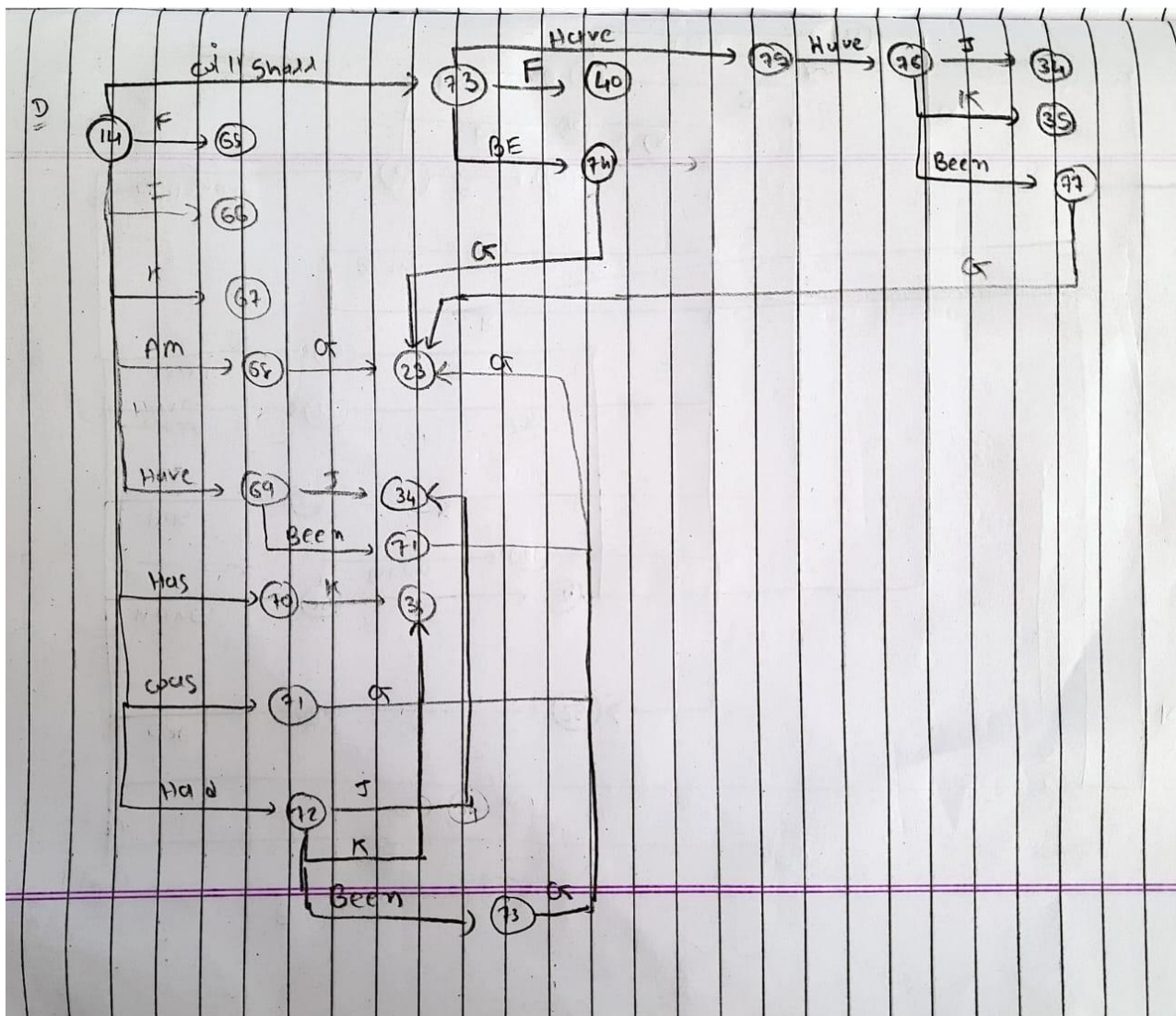
eos "."

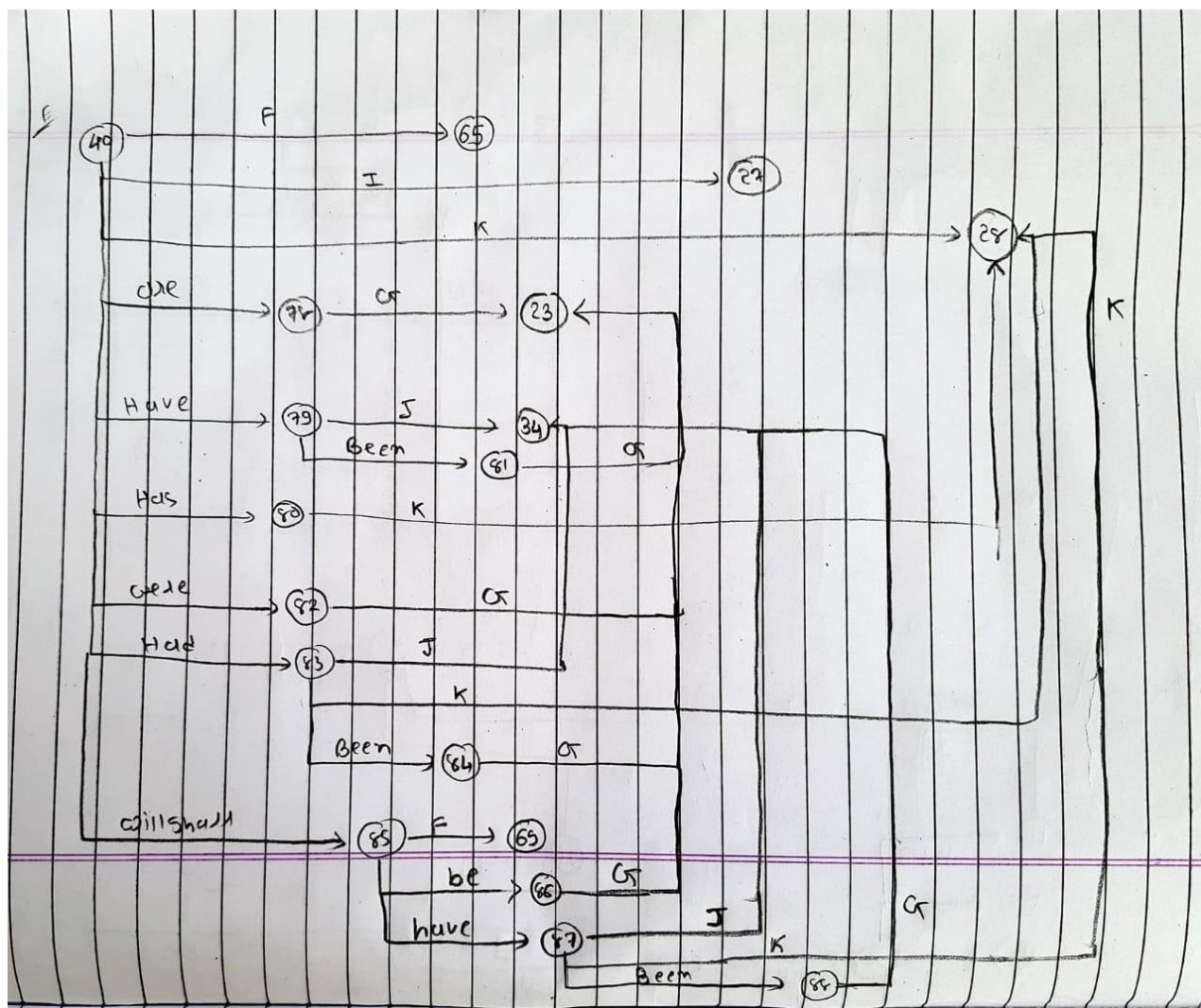
separator ", "|"and" ws

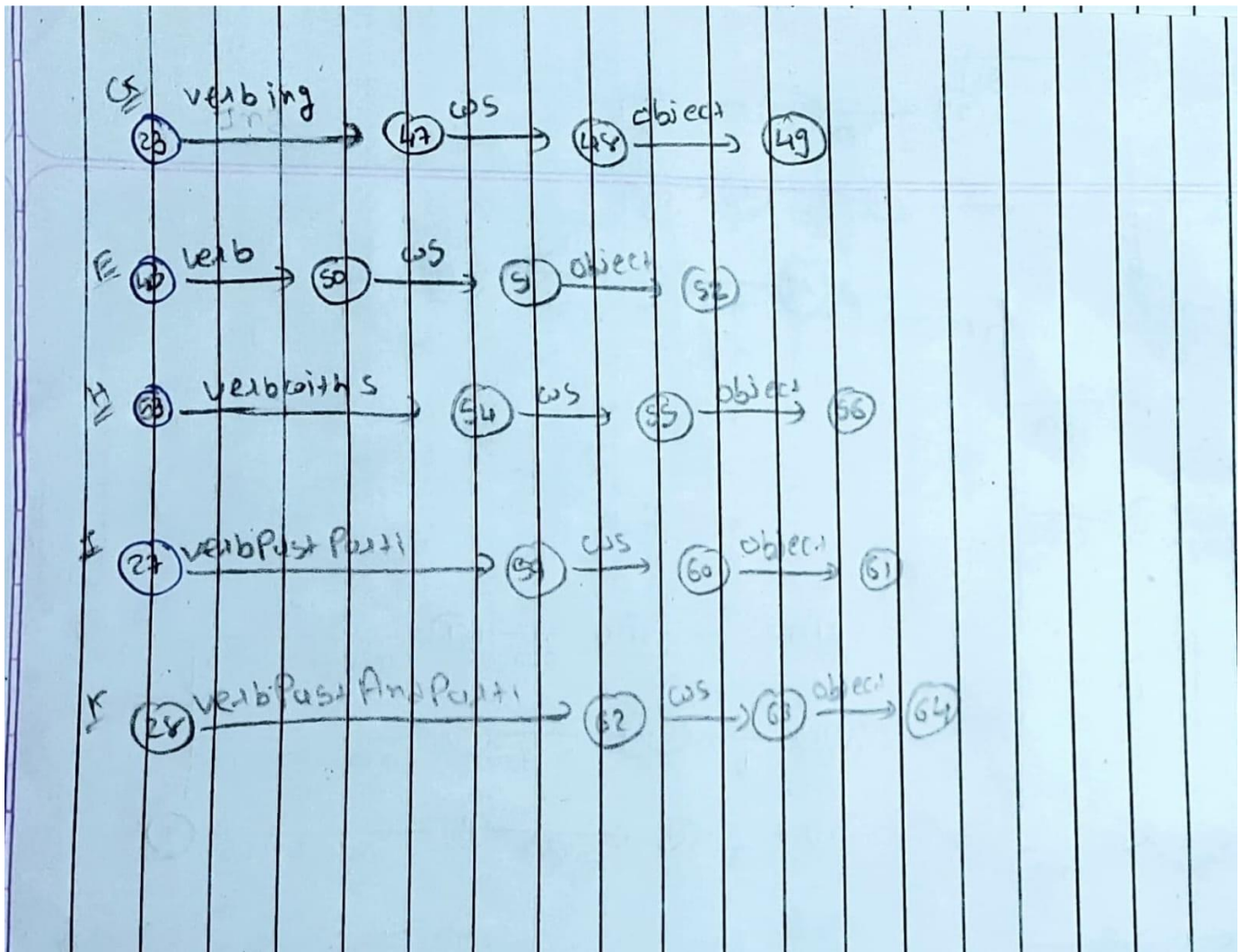
[\t \n]

2.0.2 Deterministic Finite Automata design for lexer









2.0.3 Implementation of lexer Flex

Program:

```
%{
#include<stdio.h>
#include "y.tab.h"
}%  subjecttypeone      "He"|"She"|"It"      subjecttypetwo      "I"      subjecttypethree
"We"|"They"|"You" am      "am" is      "is" are      "are" have      "have"
has      "has" had      "had" been      "been" was      "was" were
"were" willshall      "will"|"shall" be      "be" verb
"play"|"smash"|"give"|"feel"|"write"|"watch"|"ask"|"learn"|"begin"|"choos e"|"drive"
verbwiths      "plays"|"smashes"|"gives"|"feels"|"writes"|"watches"|"asks"|"learns"|"be
gins"|"chooses"|"drives"      verbwithing
"playing"|"smashing"|"giving"|"feeling"|"writing"|"watching"|"asking"|"le
arning"|"beginning"|"choosing"|"driving"
verbpastandparti      "played"|"smashed"|"felt"|"watched"|"asked"|"learned"|"learnt"
verbpast      "gave"|"wrote"|"began"|"chose"|"drove" verbpastparti
"given"|"written"|"begun"|"chosen"|"driven" object
"cricket"|"car"|"football"|"teacher"|"anime"|"maths"|"violence"|"glass"|"lett
er"|"journal"|"dog"|"blessings"|"tension"|"Netflix"|"bike" eos      "." separator
","|"and" ws      [ \t\n]
%%
{subjecttypeone}      {printf("subject = %s\n",yytext);return SUBJECTTYPEONE;}
{subjecttypetwo}      {printf("subject = %s\n",yytext);return SUBJECTTYPETWO;}
{subjecttypethree}    {printf("subject = %s\n",yytext);return SUBJECTTYPETHREE;}
{am}      {printf("am = %s\n",yytext);return AM;}
{is}      {printf("is = %s\n",yytext);return IS;}
{are}      {printf("are = %s\n",yytext);return ARE;}
{have}      {printf("have = %s\n",yytext);return HAVE;}
{has}      {printf("has = %s\n",yytext);return HAS;}
{had}      {printf("had = %s\n",yytext);return HAD;}
```

```
{been}          {printf("been = %s\n",yytext);return BEEN;}
{was}           {printf("was = %s\n",yytext);return WAS;}
{were}          {printf("were = %s\n",yytext);return WERE;}
{willshall}     {printf("will/shall = %s\n",yytext);return WILLSHALL;}
{be}            {printf("be = %s\n",yytext);return BE;}
{verbwiths}     {printf("verb-with-s = %s\n",yytext);return VERBWITHS;}
{verbwithing}   {printf("verb-with-ing = %s\n",yytext);return VERBWITHING;}
{verbpastparti} {printf("verb-past-participle = %s\n",yytext);return VERBPASTPARTI;}
{verbpast}      {printf("verb-past = %s\n",yytext);return VERBPAST;}
{verbpastandparti} {printf("verb-past-as-well-as-past-participle = %s\n",yytext);return VERBPASTANDPARTI;}
{verb}          {printf("verb = %s\n",yytext);return VERB;}
{object}        {printf("object = %s\n",yytext);return OBJECT;}
{eos}           {printf("eos = %s\n",yytext);return DOT;}
{separator}     {printf("separator = %s\n",yytext);return SEPERATOR;}
{ws}            {return WHITESPACE;}
.               {printf("Invalid Token : %s\n",yytext);return 0;return *yytext;}
%%
int yywrap()
{
return 1;
}
```

2.0.4 Execution environment setup

Step by Step Guide to Install FLEX and Run FLEX Program using Command Prompt(cmd)

Step 1

/*For downloading CODEBLOCKS */

- Open your Browser and type in "codeblocks"
- Goto to Code Blocks and go to downloads section
- Click on "Download the binary release"
- Download codeblocks-20.03mingw-setup.exe
- Install the software keep clicking on next

/*For downloading FLEX GnuWin32 */

- Open your Browser and type in "download flex gnuwin32"
- Goto to "Download GnuWin from SourceForge.net"
- Downloading will start automatically
- Install the software keep clicking on next

/*SAVE IT INSIDE C FOLDER*/

Step 2 /*PATH SETUP FOR CODEBLOCKS*/

- After successful installation

Goto program files->CodeBlocks-->MinGW-->Bin

- Copy the address of bin :- it should somewhat look like this

C:\Program Files (x86)\CodeBlocks\MinGW\bin

- Open Control Panel-->Goto System-->Advance System Settings-->Environment Variables
- Environment Variables--> Click on Path which is inside System variables - Click on edit
- Click on New and paste the copied path to it:- - C:\Program Files (x86)\CodeBlocks\MinGW\bin - Press Ok!

Step 3 /*PATH SETUP FOR GnuWin32*/

- After successful installation Goto C folder
- Goto GnuWin32-->Bin
- Copy the address of bin it should somewhat look like this

C:\GnuWin32\bin

- Open Control Panel-->Goto System-->Advance System Settings-->Environment Variables
- Environment Variables--> Click on Path which is inside System variables - Click on edit
- Click on New and paste the copied path to it:- C:\GnuWin32\bin
- Press Ok!

/*WARNING!!! PLEASE MAKE SURE THAT PATH OF CODEBLOCKS IS BEFORE GNUWIN32---THE ORDER MATTERS*/

Step 4

- Create a folder on Desktop flex_programs or whichever name you like - Open notepad type in a flex program - Save it inside the folder like filename.l
- Note :- also include `"" void yywrap(){} ""` in the .l file

/*Make sure while saving save it as all files rather than as a text document*/

Step 5 /*To RUN FLEX PROGRAM*/

- Goto to Command Prompt(cmd)
- Goto the directory where you have saved the program - Type in command :- **flex filename.l** - Type in command :- **gcc lex.yy.c**
- Execute/Run for windows command prompt :- **a.exe**

Step 6

- Finished

2.0.5 Output screenshots of lexer.

Input:

```
C:\Users\sejal\Desktop\LT>project.exe
Enter Sentence in English :
You are playing football.
```

Output:

```
Enter Sentence in English :
You are playing football.
subject = You
are = are
verb-with-ing = playing
object = football
eos = .
```

Input:

```
C:\Users\sejal\Desktop\LT>project.exe
Enter Sentence in English :
You are playing football and I am playing cricket.
```

Output:

```
subject = You
are = are
verb-with-ing = playing
object = football
separator = and
subject = I
am = am
verb-with-ing = playing
object = cricket
eos = .
```

Invalid tokens:**1. Subject starting with capital Letter:**

```
C:\Users\sejal\Desktop\LT>project.exe
Enter Sentence in English :
YOU are playing cricket.
Invalid Token : Y
```

2. Object is invalid:

```
C:\Users\sejal\Desktop\LT>project.exe
Enter Sentence in English :
I am playingggg cricket.
subject = I
am = am
verb-with-ing = playing
Invalid Token : g
```


3.0 SYNTAX ANALYZER DESIGN

3.0.1 Grammar rules

```
START -> A
A -> B DOT | B SEPERATOR A | B DOT A B ->SUBJECTTYPEONE C | SUBJECTTYPETWO D |
SUBJECTTYPETHREE E C ->H | I | K | IS G | HAS J | HAS K | HAS BEEN G | WAS G | HAD
J | HAD K | HAD BEEN G | WILLSHALL F | WILLSHALL BE G | WILLSHALL HAVE J |
WILLSHALL HAVE K | WILLSHALL HAVE BEEN G D ->F | I | K | AM G | HAVE J | HAS K |
HAVE BEEN G | WAS G | HAD J | HAD K | HAD BEEN G | WILLSHALL F | WILLSHALL BE G
| WILLSHALL HAVE J | WILLSHALL HAVE K | WILLSHALL HAVE BEEN G E ->F | I | K | ARE
G | HAVE J | HAS K | HAVE BEEN G | WERE G | HAD J | HAD K | HAD BEEN G |
WILLSHALL F | WILLSHALL BE G | WILLSHALL HAVE J | WILLSHALL HAVE K | WILLSHALL
HAVE BEEN G F -> VERB OBJECT G -> VERBWITHING OBJECT H -> VERBWITHS OBJECT I ->
VERBPAST OBJECT J -> VERBPASTPARTI OBJECT K -> VERBPASTANDPARTI OBJECT
```

3.0.2 Yacc based imlementation of syntax analyzer

```

• project.l (Lex file) %{
#include<stdio.h>
#include "y.tab.h"
%}    subjecttypeone      "He"|"She"|"It"    subjecttypetwo      "I"    subjecttypethree
"We"|"They"|"You" am      "am" is          "is" are          "are" have          "have"
has      "has" had        "had" been        "been" was          "was" were
"were"   willshall        "will"|"shall"   be          "be"   verb
"play"|"smash"|"give"|"feel"|"write"|"watch"|"ask"|"learn"|"begin"|"choos   e"|"drive"
verbwiths      "plays"|"smashes"|"gives"|"feels"|"writes"|"watches"|"askes"|"learns"|"be
gins"|"chooses"|"drives"                                     verbwithing
"playing"|"smashing"|"giving"|"feeling"|"writing"|"watching"|"asking"|"le
arning"|"beginning"|"choosing"|"driving"                               verbpastandparti
"played"|"smashed"|"felt"|"Watched"|"asked"|"learned"|"learnt"          verbpast
"gave"|"wrote"|"began"|"chose"|"drove"                                   verbpastparti
"given"|"written"|"begun"|"chosen"|"driven"
object
"cricket"|"car"|"football"|"teacher"|"anime"|"maths"|"violence"|"glass"|"lett
er"|"journal"|"dog"|"blessings"|"tension"|"Netflix"|"bike" eos          "." separator
","|"and" ws      [ \t\n]
%%
{subjecttypeone}      {printf("subject = %s\n",yytext);return SUBJECTTYPEONE;}
{subjecttypetwo}      {printf("subject = %s\n",yytext);return SUBJECTTYPETWO;}
{subjecttypethree}    {printf("subject = %s\n",yytext);return SUBJECTTYPETHREE;}
{am}                  {printf("am = %s\n",yytext);return AM;}
{is}                  {printf("is = %s\n",yytext);return IS;}
{are}                 {printf("are = %s\n",yytext);return ARE;}
{have}                {printf("have = %s\n",yytext);return HAVE;}
{has}                 {printf("has = %s\n",yytext);return HAS;}
{had}                 {printf("had = %s\n",yytext);return HAD;}
{been}                {printf("been = %s\n",yytext);return BEEN;}
{was}                 {printf("was = %s\n",yytext);return WAS;}
{were}                {printf("were = %s\n",yytext);return WERE;}

```

```

{willshall}      {printf("will/shall = %s\n",yytext);return WILLSHALL;}
{be}             {printf("be = %s\n",yytext);return BE;}
{verbwiths}      {printf("verb-with-s = %s\n",yytext);return VERBWITHS;}
{verbwithing}    {printf("verb-with-ing = %s\n",yytext);return VERBWITHING;}
{verbpastparti}  {printf("verb-past-participle = %s\n",yytext);return VERBPASTPARTI;}
{verbpast}       {printf("verb-past = %s\n",yytext);return VERBPAST;}
{verbpastandparti} {printf("verb-past-as-well-as-past-participle = %s\n",yytext);return
VERBPASTANDPARTI;}
{verb}           {printf("verb = %s\n",yytext);return VERB;}
{object}         {printf("object = %s\n",yytext);return OBJECT;}
{eos}            {printf("eos = %s\n",yytext);return DOT;}
{separator}      {printf("separator = %s\n",yytext);return SEPERATOR;}
{ws}             {return WHITESPACE;}
.               {printf("Invalid Token : %s\n",yytext);return 0;return *yytext;}
%%
int yywrap()
{ return 1;
}

```

- **project.y (yacc code)**

```

4      %{
5      #include<stdio.h>
6      #include<stdlib.h>
7      #define YYERROR_VERBOSE 1
8      void yyerror(char *err);
9      %}
10     %token SUBJECTTYPEONE SUBJECTTYPETWO SUBJECTTYPETHREE AM IS ARE HAVE HAS HAD
        BEEN WAS WERE WILLSHALL BE VERB VERBWITHS VERBWITHING VERBPAST VERBPASTPARTI
        VERBPASTANDPARTI OBJECT SEPERATOR DOT WHITESPACE
11     %%
12     START : A {printf("\nSentence is grammatically correct !!!\n");return 0;};
13     A : B DOT WHITESPACE | B WHITESPACE SEPERATOR WHITESPACE A | B WHITESPACE DOT
        WHITESPACE A;
14     B : SUBJECTTYPEONE WHITESPACE C | SUBJECTTYPETWO WHITESPACE D |
        SUBJECTTYPETHREE WHITESPACE E;
15     C : H | I | K | IS WHITESPACE G | HAS WHITESPACE J | HAS WHITESPACE K | HAS
        WHITESPACE BEEN WHITESPACE G | WAS WHITESPACE G | HAD WHITESPACE J | HAD
        WHITESPACE K | HAD WHITESPACE BEEN WHITESPACE G | WILLSHALL WHITESPACE F |
        WILLSHALL WHITESPACE BE WHITESPACE G | WILLSHALL WHITESPACE HAVE WHITESPACE J |
        WILLSHALL WHITESPACE HAVE WHITESPACE K | WILLSHALL WHITESPACE HAVE WHITESPACE
        BEEN WHITESPACE G;
16     D : F | I | K | AM WHITESPACE G | HAVE WHITESPACE J | HAS WHITESPACE K | HAVE
        WHITESPACE BEEN WHITESPACE G | WAS WHITESPACE G | HAD WHITESPACE J | HAD
        WHITESPACE K | HAD WHITESPACE BEEN WHITESPACE G | WILLSHALL WHITESPACE F |
        WILLSHALL WHITESPACE BE WHITESPACE G | WILLSHALL WHITESPACE HAVE WHITESPACE J |
        WILLSHALL WHITESPACE HAVE WHITESPACE K | WILLSHALL WHITESPACE HAVE WHITESPACE
        BEEN WHITESPACE G;

```

```
17  E : F | I | K | ARE WHITESPACE G | HAVE WHITESPACE J | HAS WHITESPACE K | HAVE
    WHITESPACE BEEN WHITESPACE G | WERE WHITESPACE G | HAD WHITESPACE J | HAD
    WHITESPACE K | HAD WHITESPACE BEEN WHITESPACE G | WILLSHALL WHITESPACE F |
    WILLSHALL WHITESPACE BE WHITESPACE G | WILLSHALL WHITESPACE HAVE WHITESPACE J |
    WILLSHALL WHITESPACE HAVE WHITESPACE K | WILLSHALL WHITESPACE HAVE WHITESPACE
    BEEN WHITESPACE G;

18  F : VERB WHITESPACE OBJECT;
19  G : VERBWITHING WHITESPACE OBJECT;
20  H : VERBWITHS WHITESPACE OBJECT;
21  I : VERBPAST WHITESPACE OBJECT;
22  J : VERBPASTPARTI WHITESPACE OBJECT;
23  K : VERBPASTANDPARTI WHITESPACE OBJECT;
24  %%
25  void yyerror(char *err)
26  {
27      printf("Error: ");
28      fprintf(stderr,"%s\n",err);
29      exit(1);
30  }
31  int main()
32  {
33      printf("Enter Sentence in English :\n");
34      yyparse();
35  }
```

3.0.3 Execution environment setup

Download flex and bison from the given links.

<http://gnuwin32.sourceforge.net/packages/flex.htm>

<http://gnuwin32.sourceforge.net/packages/bison.htm>

when installing on windows you store this in c:/gnuwin32 folder and not in c:/program files(X86)/gnuwin32

Download IDE

<https://sourceforge.net/projects/orwelldevcpp/> set environment variable for flex and bison.

To run the program:

Open a prompt, cd to the directory where your ".l" and ".y" are, and compile them with:

```
flex project.l bison -dy project.y  
gcc lex.yy.c y.tab.c -o  
project.exe
```

3.0.4 Output screenshots of yacc based implementation

- Valid Input with all the possible combinations:

```
C:\Users\sejal\Desktop\LT>project
Enter Sentence in English :
I am playing cricket and You are writing journal.
subject = I
am = am
verb-with-ing = playing
object = cricket
separator = and
subject = You
are = are
verb-with-ing = writing
object = journal
eos = .
```

```
C:\Users\sejal\Desktop\LT>project
Enter Sentence in English :
We will watch anime.
subject = We
will/shall = will
verb = watch
object = anime
eos = .

Sentence is grammatically correct !!!
```

```
C:\Users\sejal\Desktop\LT>project
Enter Sentence in English :
You were learning maths.
subject = You
were = were
verb-with-ing = learning
object = maths
eos = .

Sentence is grammatically correct !!!
```

- **Invalid Syntax:**

1. **Program is not complete yet (expecting input after SEPERATOR)**

```
C:\Users\sejal\Desktop\LT>project
Enter Sentence in English :
You were learning maths,
subject = You
were = were
verb-with-ing = learning
object = maths
separator = ,
Error: syntax error, unexpected SEPERATOR, expecting DOT or WHITESPACE
```

2. **Dot should be used to mark end of the sentence**

```
C:\Users\sejal\Desktop\LT>project
Enter Sentence in English :
You were learning maths ?
subject = You
were = were
verb-with-ing = learning
object = maths
Invalid Token : ?
Error: syntax error, unexpected $end, expecting SEPERATOR or DOT
```

3. **Expecting Seperator**

```
C:\Users\sejal\Desktop\LT>project
Enter Sentence in English :
You were learning maths He is playing cricket.
subject = You
were = were
verb-with-ing = learning
object = maths
subject = He
Error: syntax error, unexpected SUBJECTTYPEONE, expecting SEPERATOR or DOT
```


4. Missing object

```
C:\Users\sejal\Desktop\LT>project
Enter Sentence in English :
He is playing .
subject = He
is = is
verb-with-ing = playing
eos = .
Error: syntax error, unexpected DOT, expecting OBJECT
```

5. Invalid token

```
C:\Users\sejal\Desktop\LT>project
Enter Sentence in English :
You ware learning maths.
subject = You
Invalid Token : w
Error: syntax error, unexpected $end
```

GitHub Link: <https://github.com/Mehul773/English-Sentence-Analysis-System.git>

4.0 CONCLUSION

This project has been implemented from what we have learned in our college curriculum and many rich resources from the web. After doing this project we conclude that we have got more knowledge about how different compilers are working in practical world and also how various types of errors are handled.