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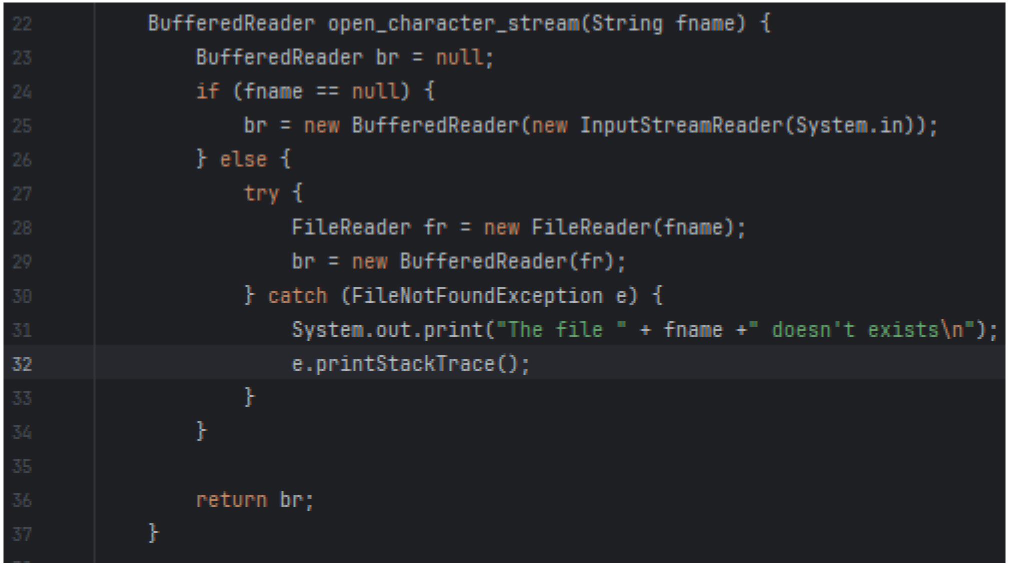
Document Format:

- Function
- Source Code
- CFG Diagram

Function 1:

1. **BufferedReader open_character_stream(String fname)**



```
22      BufferedReader open_character_stream(String fname) {
23          BufferedReader br = null;
24          if (fname == null) {
25              br = new BufferedReader(new InputStreamReader(System.in));
26          } else {
27              try {
28                  FileReader fr = new FileReader(fname);
29                  br = new BufferedReader(fr);
30              } catch (FileNotFoundException e) {
31                  System.out.print("The file " + fname +" doesn't exists\n");
32                  e.printStackTrace();
33              }
34          }
35
36          return br;
37      }
```

Block Number	**Lines Number**
1	23, 24
2	25
3	28,29
4	36

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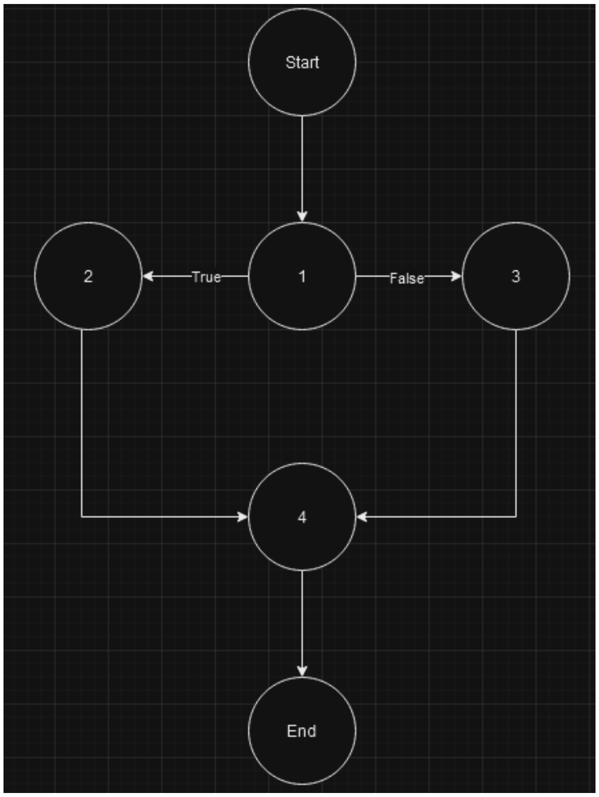
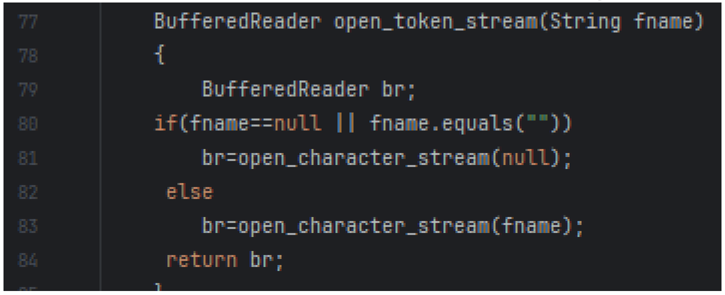


Function 2:

2. **BufferedReader open_token_stream(String fname)**



```
77      BufferedReader open_token_stream(String fname)
78      {
79          BufferedReader br;
80      if(fname==null || fname.equals(""))
81          br=open_character_stream(null);
82       else
83          br=open_character_stream(fname);
84       return br;
85      }
```

Block Number	**Lines Number**
1	79,80
2	81
3	83
4	84

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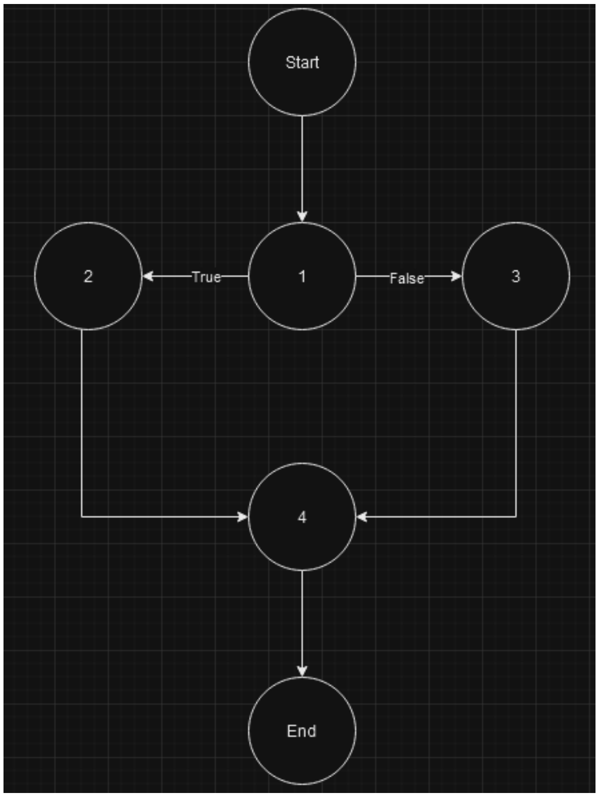

Function 3

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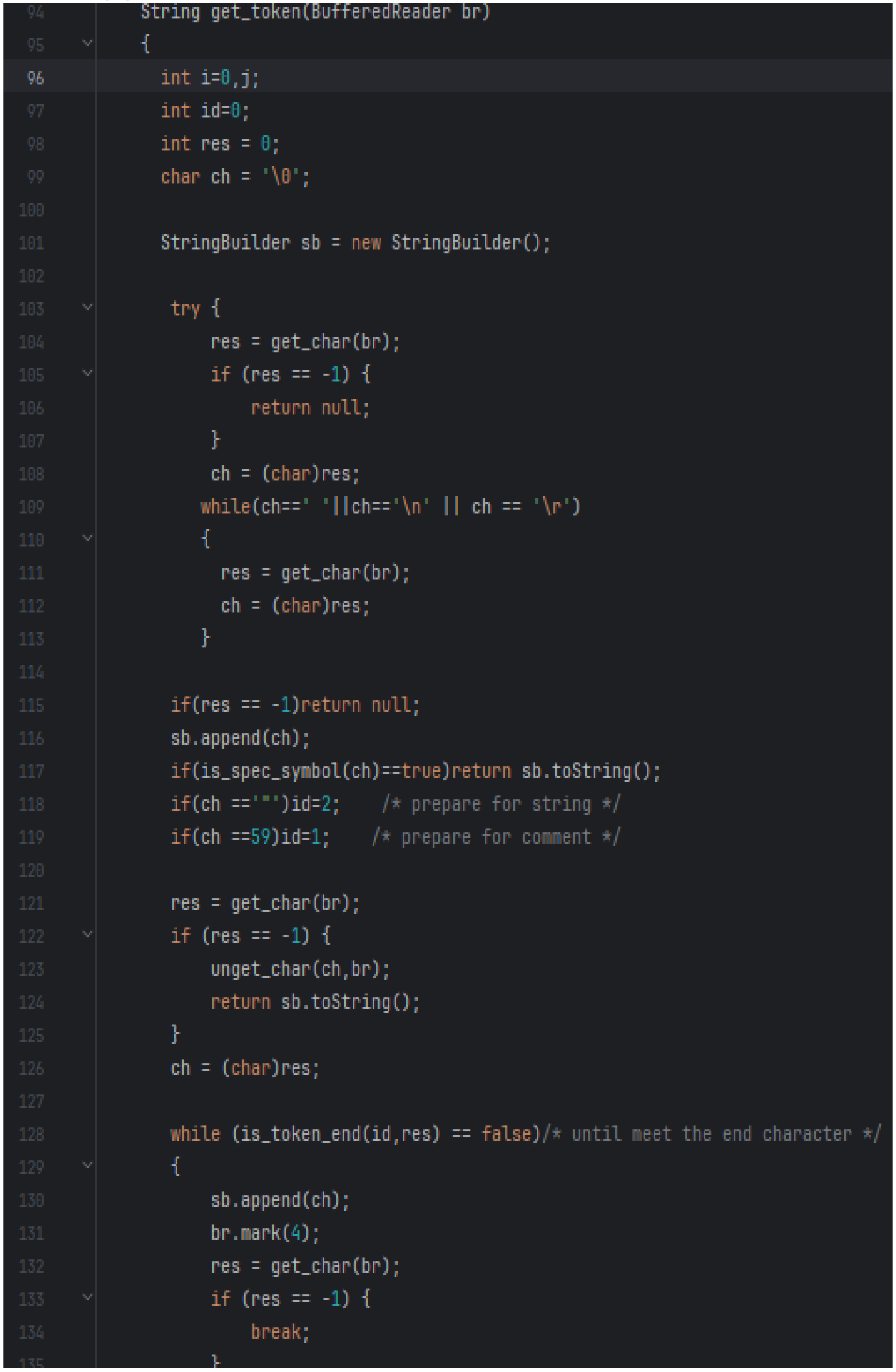
3. **String get_token(BufferedReader br)**



```
String get_token(BufferedReader br)
{
  int i=0,j;
  int id=0;
  int res = 0;
  char ch = '\0';

  StringBuilder sb = new StringBuilder();

   try {
       res = get_char(br);
       if (res == -1) {
           return null;
       }
       ch = (char)res;
      while(ch==' '||ch=='\n' || ch == '\r')
      {
        res = get_char(br);
        ch = (char)res;
      }

   if(res == -1)return null;
   sb.append(ch);
   if(is_spec_symbol(ch)==true)return sb.toString();
   if(ch =='"')id=2;    /* prepare for string */
   if(ch ==59)id=1;    /* prepare for comment */

   res = get_char(br);
   if (res == -1) {
       unget_char(ch,br);
       return sb.toString();
   }
   ch = (char)res;

   while (is_token_end(id,res) == false)/* until meet the end character */
   {
       sb.append(ch);
       br.mark(4);
       res = get_char(br);
       if (res == -1) {
           break;
       }
```

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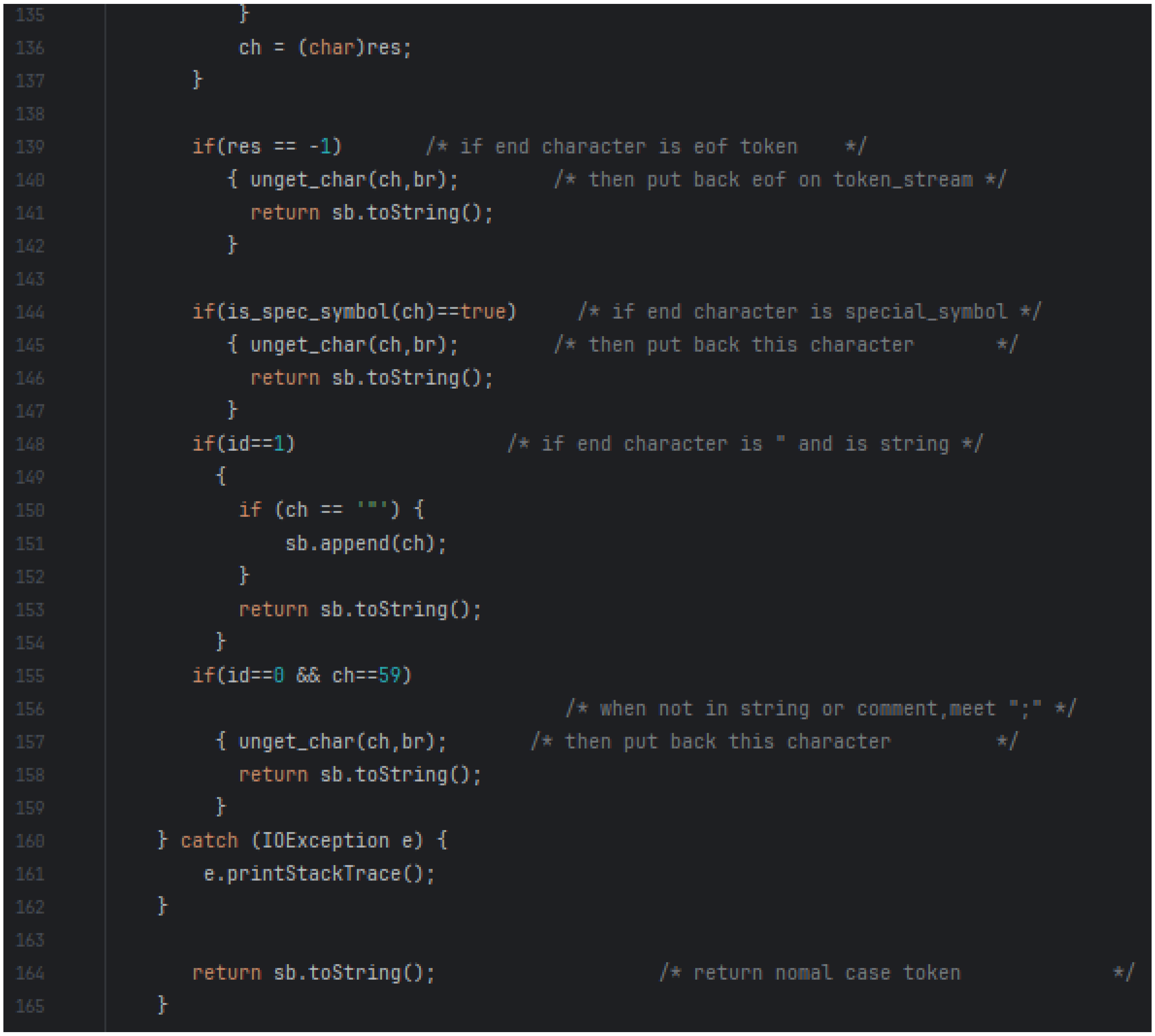

```
135            }
136            ch = (char)res;
137        }
138
139        if(res == -1)       /* if end character is eof token    */
140           { unget_char(ch,br);        /* then put back eof on token_stream */
141             return sb.toString();
142           }
143
144        if(is_spec_symbol(ch)==true)     /* if end character is special_symbol */
145           { unget_char(ch,br);        /* then put back this character       */
146             return sb.toString();
147           }
148        if(id==1)                  /* if end character is " and is string */
149          {
150            if (ch == '"') {
151                sb.append(ch);
152            }
153            return sb.toString();
154          }
155        if(id==0 && ch==59)
156                                    /* when not in string or comment,meet ";" */
157          { unget_char(ch,br);       /* then put back this character         */
158            return sb.toString();
159          }
160     } catch (IOException e) {
161         e.printStackTrace();
162     }
163
164        return sb.toString();                  /* return nomal case token            */
165     }
```

Block Number	Lines Number
1	96,97,98,99,101,104,105
2	106
3	108
4	109
5	111,112
6	115
7	115
8	116,117
9	117
10	118
11	118
12	119
13	119
14	121,122
15	123,124

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16	126
17	128
18	130,131,132,133
19	134
20	136
21	139
22	140,141
23	144
24	145,146
25	148
26	150,151
27	153
28	155,156
29	162

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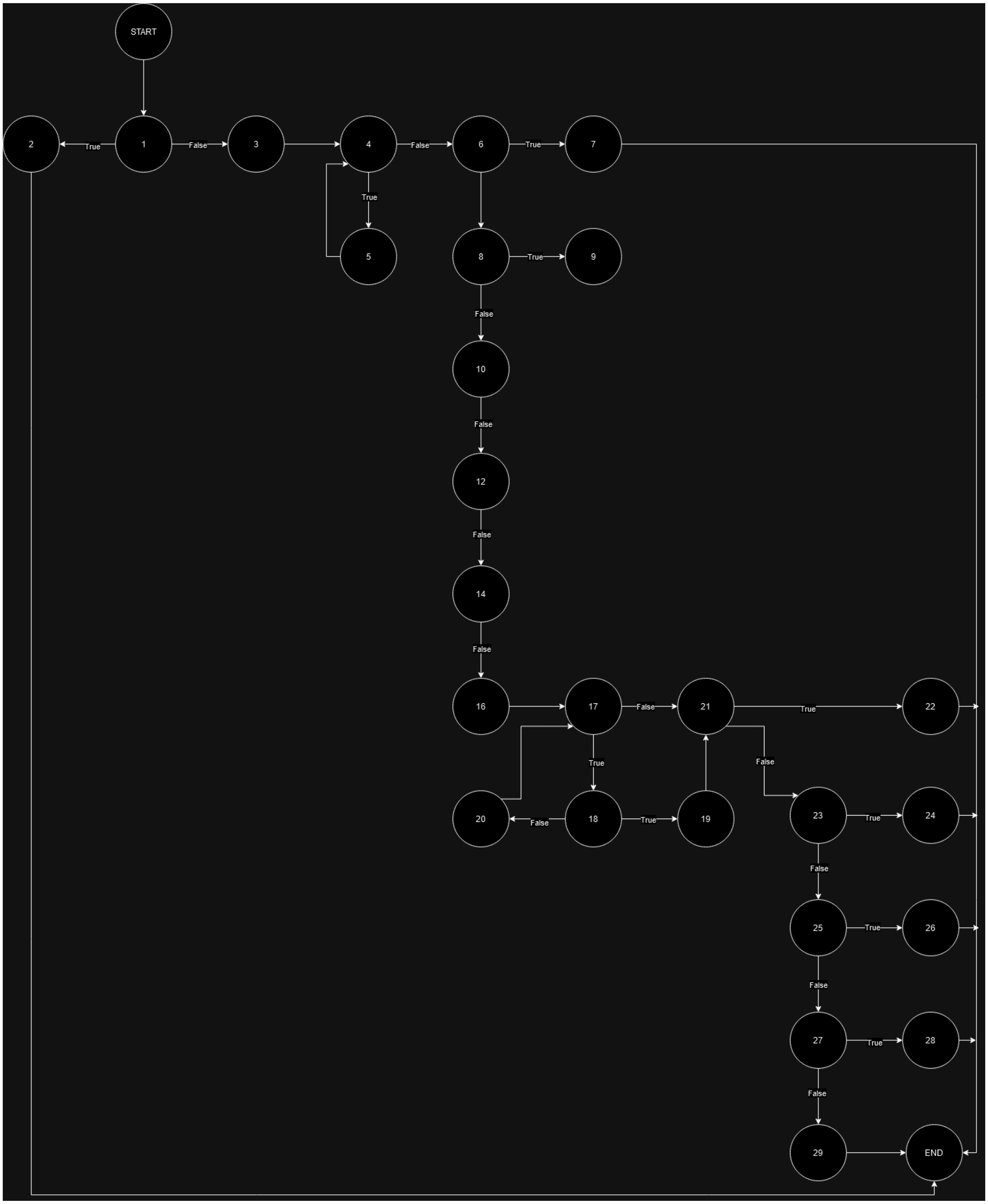

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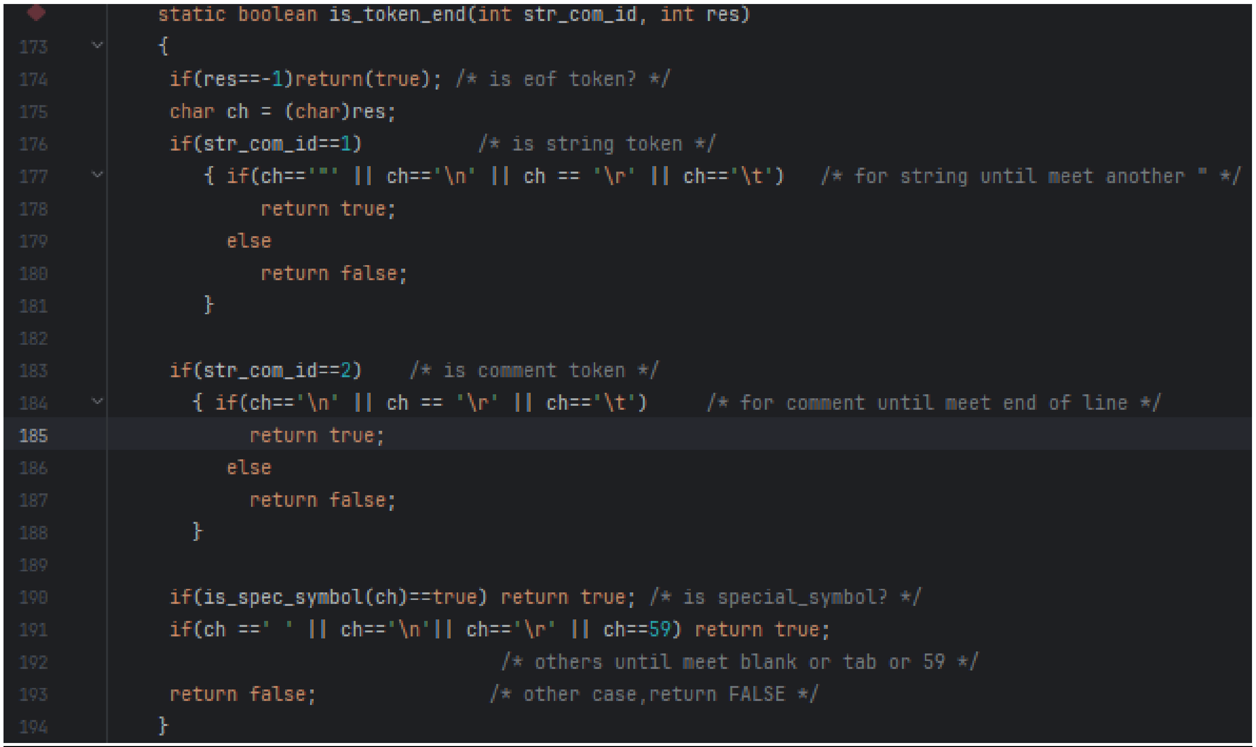
Function 4:

4. boolean is_token_end(int str_com_id, int res)



```
         static boolean is_token_end(int str_com_id, int res)
173      {
174       if(res==-1)return(true); /* is eof token? */
175       char ch = (char)res;
176       if(str_com_id==1)          /* is string token */
177          { if(ch=='"' || ch=='\n' || ch == '\r' || ch=='\t')   /* for string until meet another " */
178              return true;
179           else
180              return false;
181          }
182
183       if(str_com_id==2)    /* is comment token */
184         { if(ch=='\n' || ch == '\r' || ch=='\t')     /* for comment until meet end of line */
185             return true;
186           else
187             return false;
188         }
189
190       if(is_spec_symbol(ch)==true) return true; /* is special_symbol? */
191       if(ch ==' ' || ch=='\n'|| ch=='\r' || ch==59) return true;
192                                   /* others until meet blank or tab or 59 */
193       return false;              /* other case,return FALSE */
194      }
```

Block Number	Line Number
1	174
2	174
3	175,176
4	177
5	178
6	180
7	183
8	184
9	185
10	187
11	190
12	190
13	191
14	191
15	193

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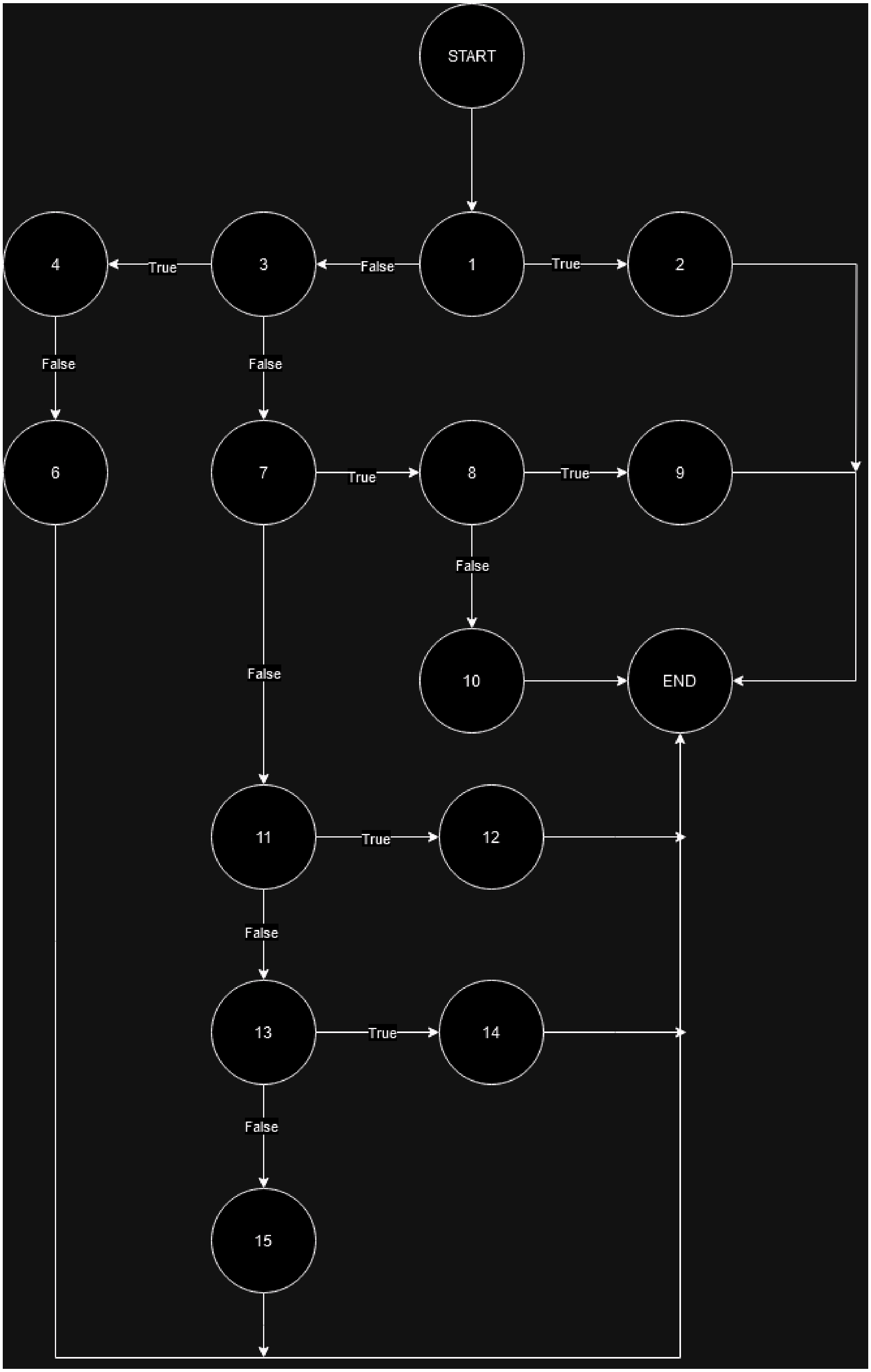

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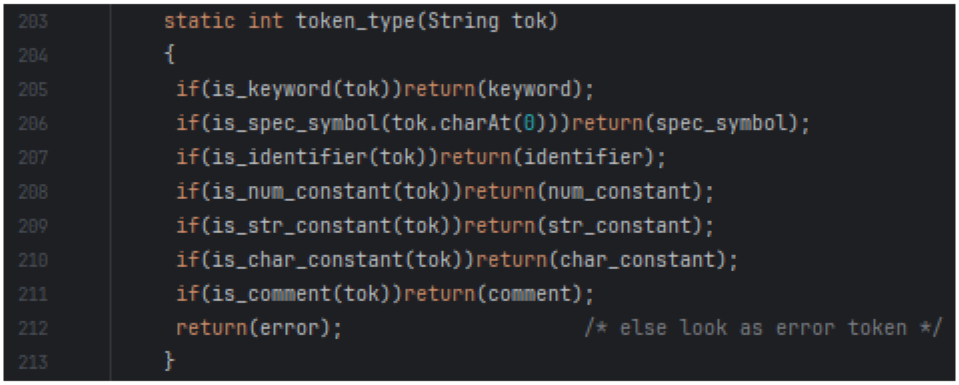
<u>Function 5:</u>

5. int token_type(String tok)



```
203     static int token_type(String tok)
204     {
205      if(is_keyword(tok))return(keyword);
206      if(is_spec_symbol(tok.charAt(0)))return(spec_symbol);
207      if(is_identifier(tok))return(identifier);
208      if(is_num_constant(tok))return(num_constant);
209      if(is_str_constant(tok))return(str_constant);
210      if(is_char_constant(tok))return(char_constant);
211      if(is_comment(tok))return(comment);
212      return(error);                  /* else look as error token */
213     }
```

Block Numbers	Line Numbers
1	205
2	205
3	206
4	206
5	207
6	207
7	208
8	208
9	209
10	209
11	210
12	210
13	211
14	211
15	212

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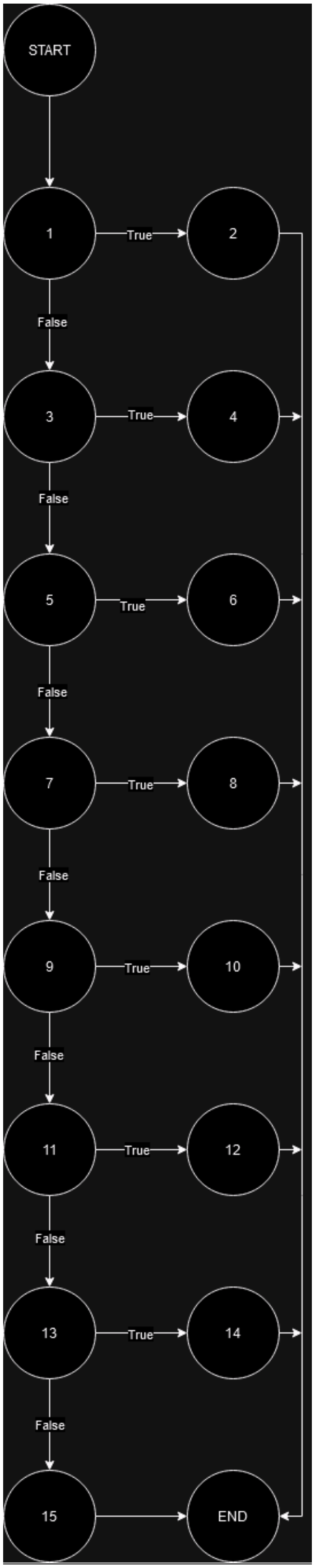

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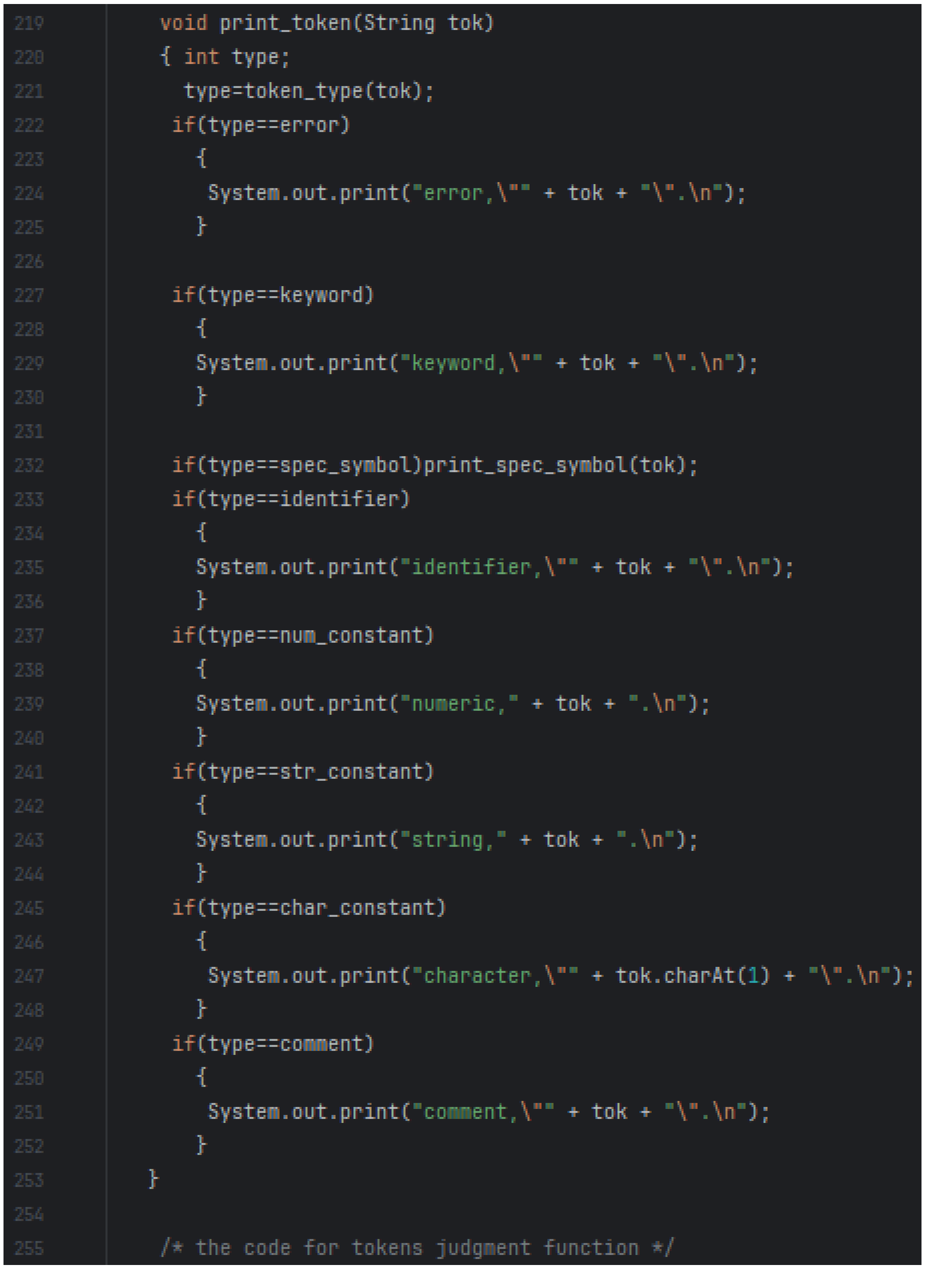
<u>Function 6:</u>

6. void print_token(String tok)



```
219   void print_token(String tok)
220   { int type;
221     type=token_type(tok);
222    if(type==error)
223      {
224       System.out.print("error,\"" + tok + "\".\n");
225      }
226
227    if(type==keyword)
228      {
229      System.out.print("keyword,\"" + tok + "\".\n");
230      }
231
232    if(type==spec_symbol)print_spec_symbol(tok);
233    if(type==identifier)
234      {
235      System.out.print("identifier,\"" + tok + "\".\n");
236      }
237    if(type==num_constant)
238      {
239      System.out.print("numeric," + tok + ".\n");
240      }
241    if(type==str_constant)
242      {
243      System.out.print("string," + tok + ".\n");
244      }
245    if(type==char_constant)
246      {
247       System.out.print("character,\"" + tok.charAt(1) + "\".\n");
248      }
249    if(type==comment)
250      {
251       System.out.print("comment,\"" + tok + "\".\n");
252      }
253  }
254
255   /* the code for tokens judgment function */
```

1	220,221,222
2	224
3	227
4	229
5	232
6	232
7	233
8	235

9	237
10	239
11	241
12	243
13	245
14	247
15	249
16	251

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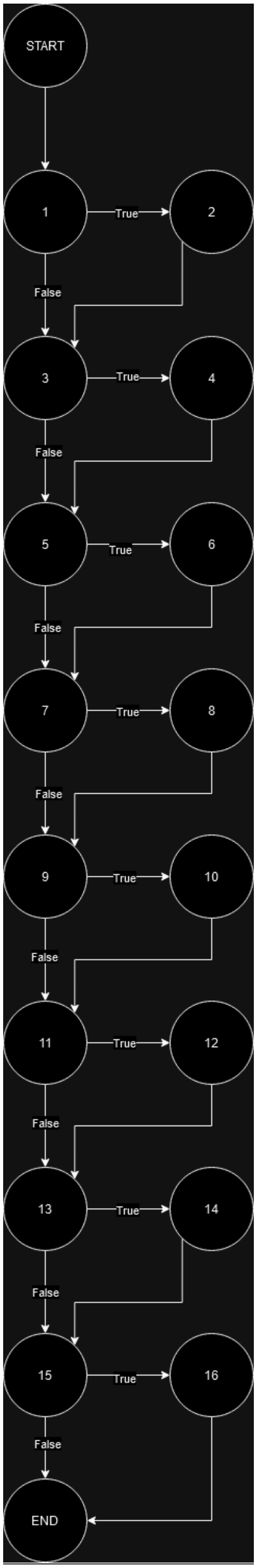

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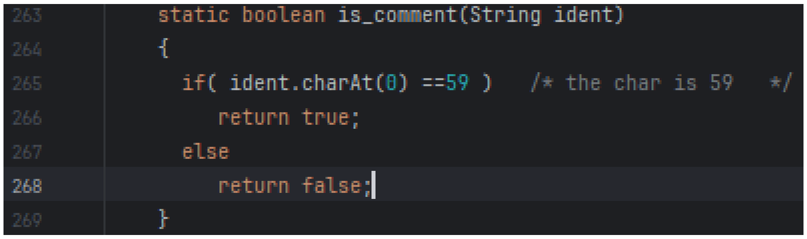
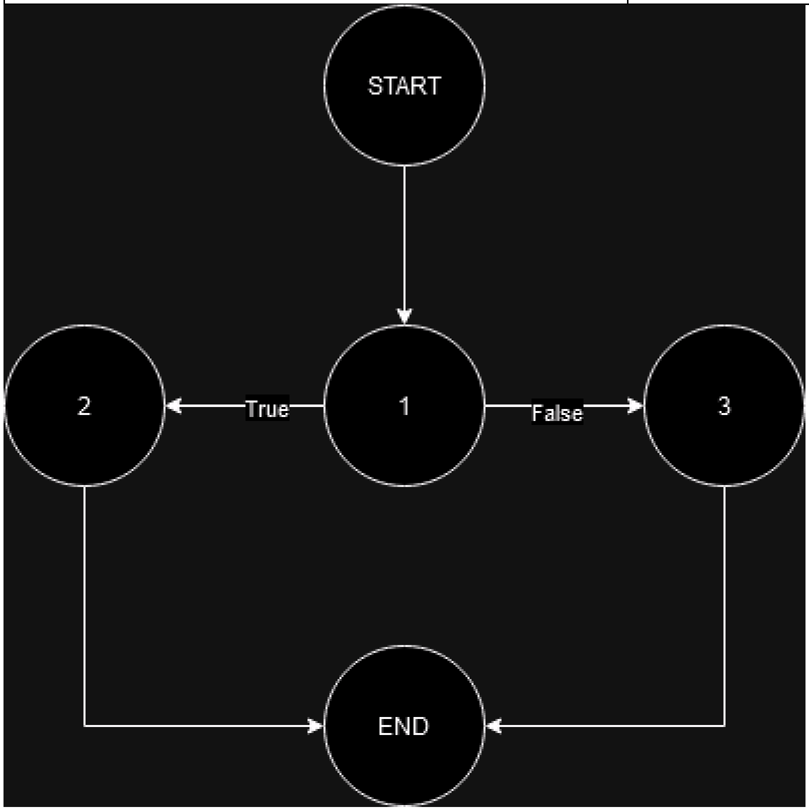
<u>Function 7:</u>

7. boolean is_comment(String ident)



```
263       static boolean is_comment(String ident)
264       {
265         if( ident.charAt(0) ==59 )   /* the char is 59   */
266            return true;
267         else
268            return false;
269       }
```

Block Number	Line Number
1	265
2	266
3	268



<u>Function 8:</u>

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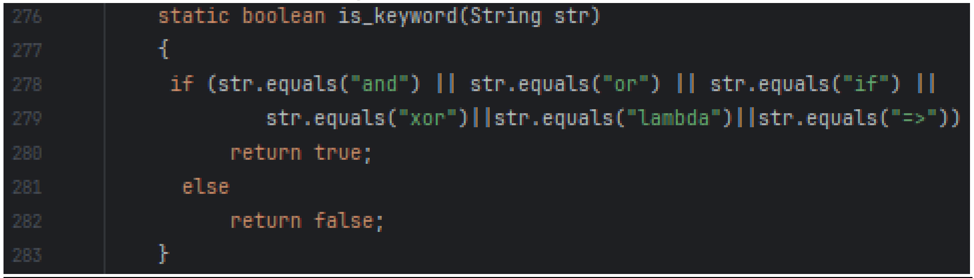
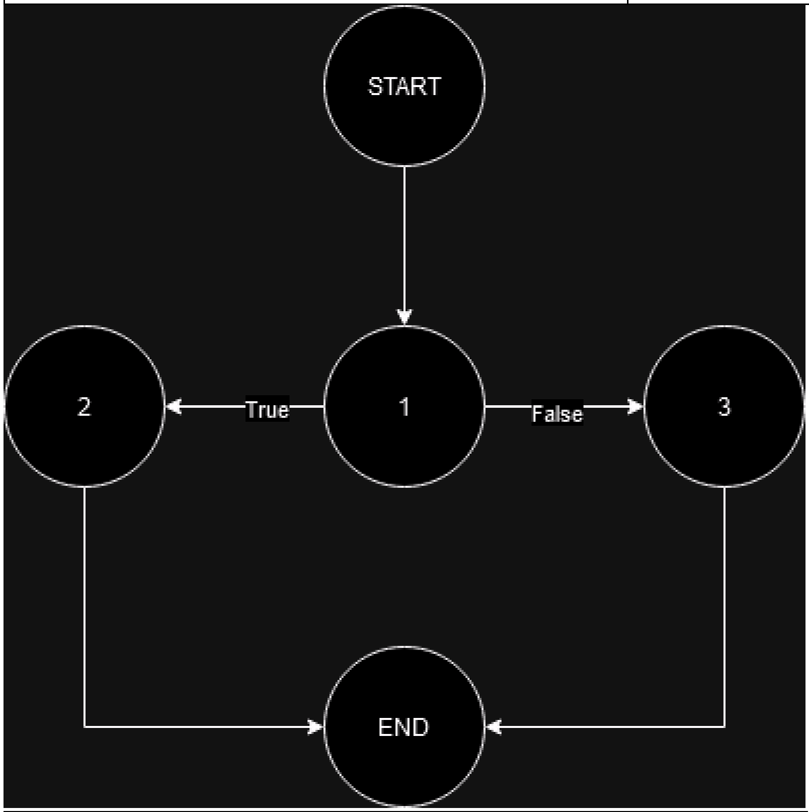
8. boolean is_keyword(String str)



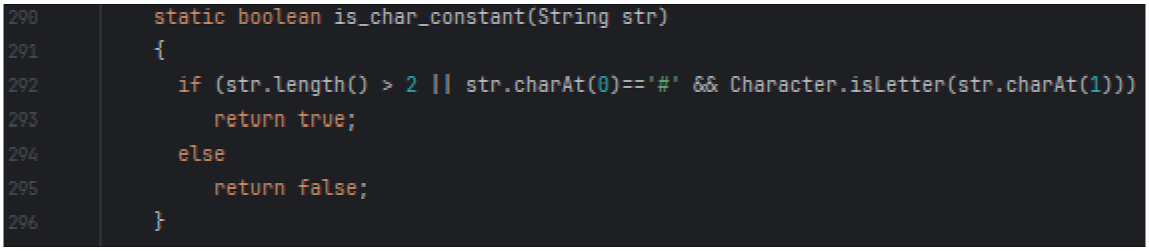
```
276        static boolean is_keyword(String str)
277        {
278         if (str.equals("and") || str.equals("or") || str.equals("if") ||
279                 str.equals("xor")||str.equals("lambda")||str.equals("=>"))
280             return true;
281          else
282             return false;
283        }
```

Block Numbers	Line Numbers
1	278,279
2	280
3	282



<u>Function 9:</u>

9. boolean is_char_constant(String str)



```
290        static boolean is_char_constant(String str)
291        {
292          if (str.length() > 2 || str.charAt(0)=='#' && Character.isLetter(str.charAt(1)))
293             return true;
294          else
295             return false;
296        }
```

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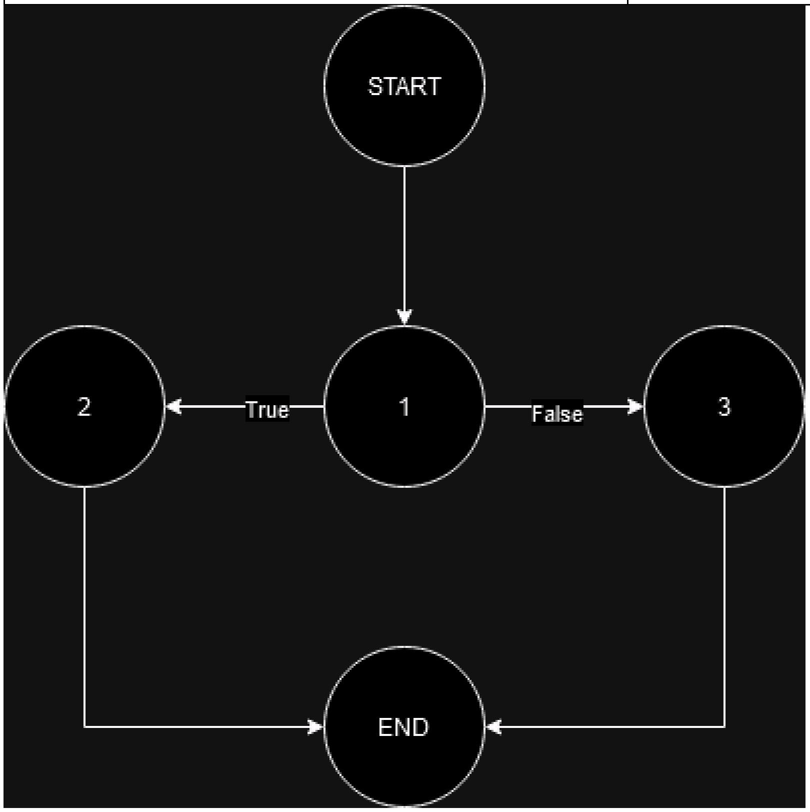
Block Numbers	Line Numbers
1	292
2	293
3	295



<u>Function 10:</u>

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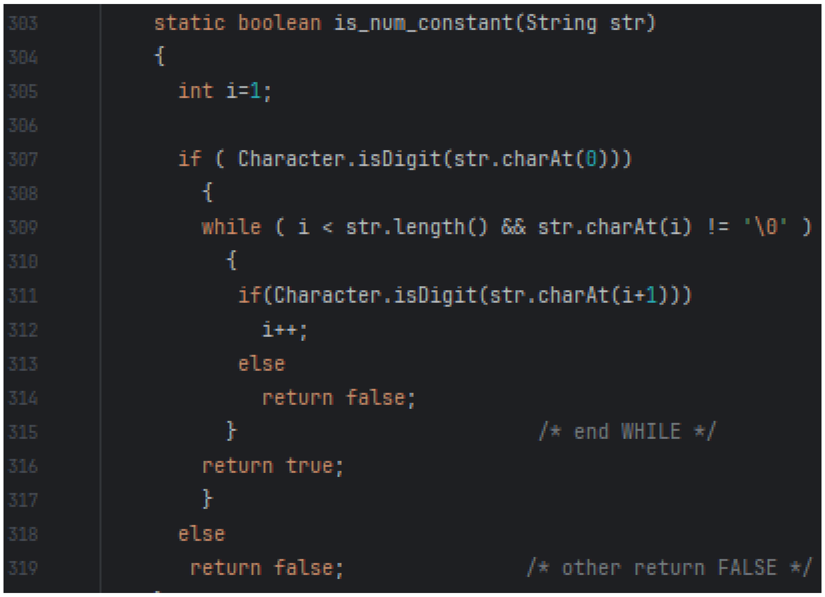
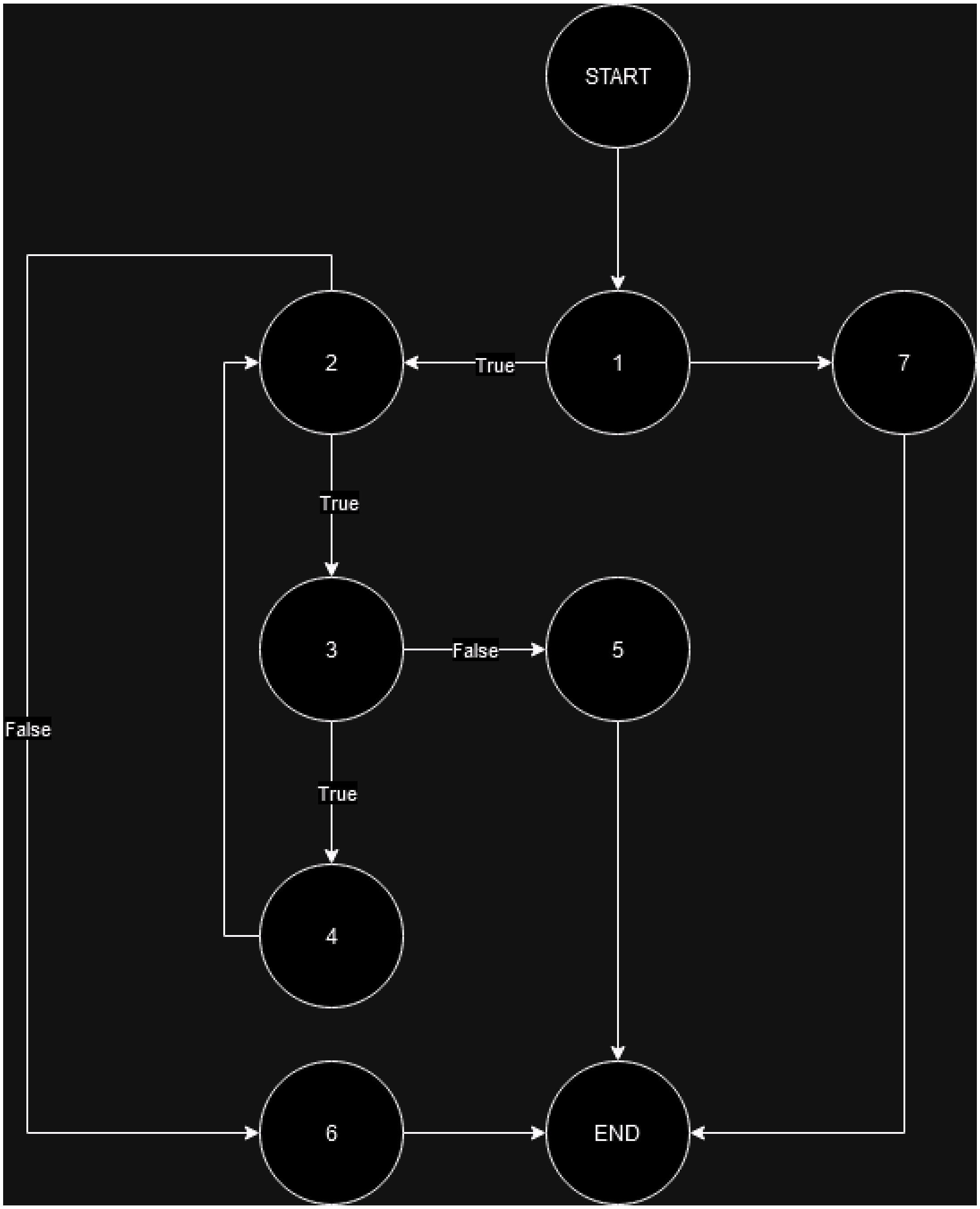
10. boolean is_num_constant(String str)



```
303  static boolean is_num_constant(String str)
304  {
305    int i=1;
306
307    if ( Character.isDigit(str.charAt(0)))
308      {
309      while ( i < str.length() && str.charAt(i) != '\0' )
310        {
311         if(Character.isDigit(str.charAt(i+1)))
312           i++;
313         else
314           return false;
315        }                         /* end WHILE */
316      return true;
317      }
318    else
319     return false;               /* other return FALSE */
```

Block Numbers	Line Numbers
1	305,307
2	309
3	311
4	312
5	314
6	316
7	319



Function 11:

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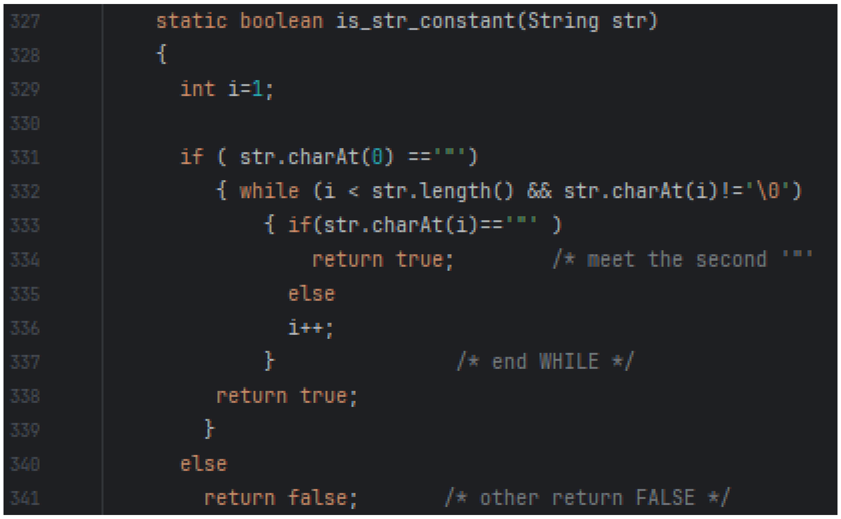
11. boolean is_str_constant(String str)



```
327  static boolean is_str_constant(String str)
328  {
329    int i=1;
330
331    if ( str.charAt(0) =='"')
332       { while (i < str.length() && str.charAt(i)!='\0')
333           { if(str.charAt(i)=='"' )
334               return true;        /* meet the second '"'
335             else
336             i++;
337           }               /* end WHILE */
338       return true;
339      }
340    else
341      return false;       /* other return FALSE */
```

Block Numbers	Line Numbers
1	329,331
2	332
3	333
4	334
5	336
6	338
7	341

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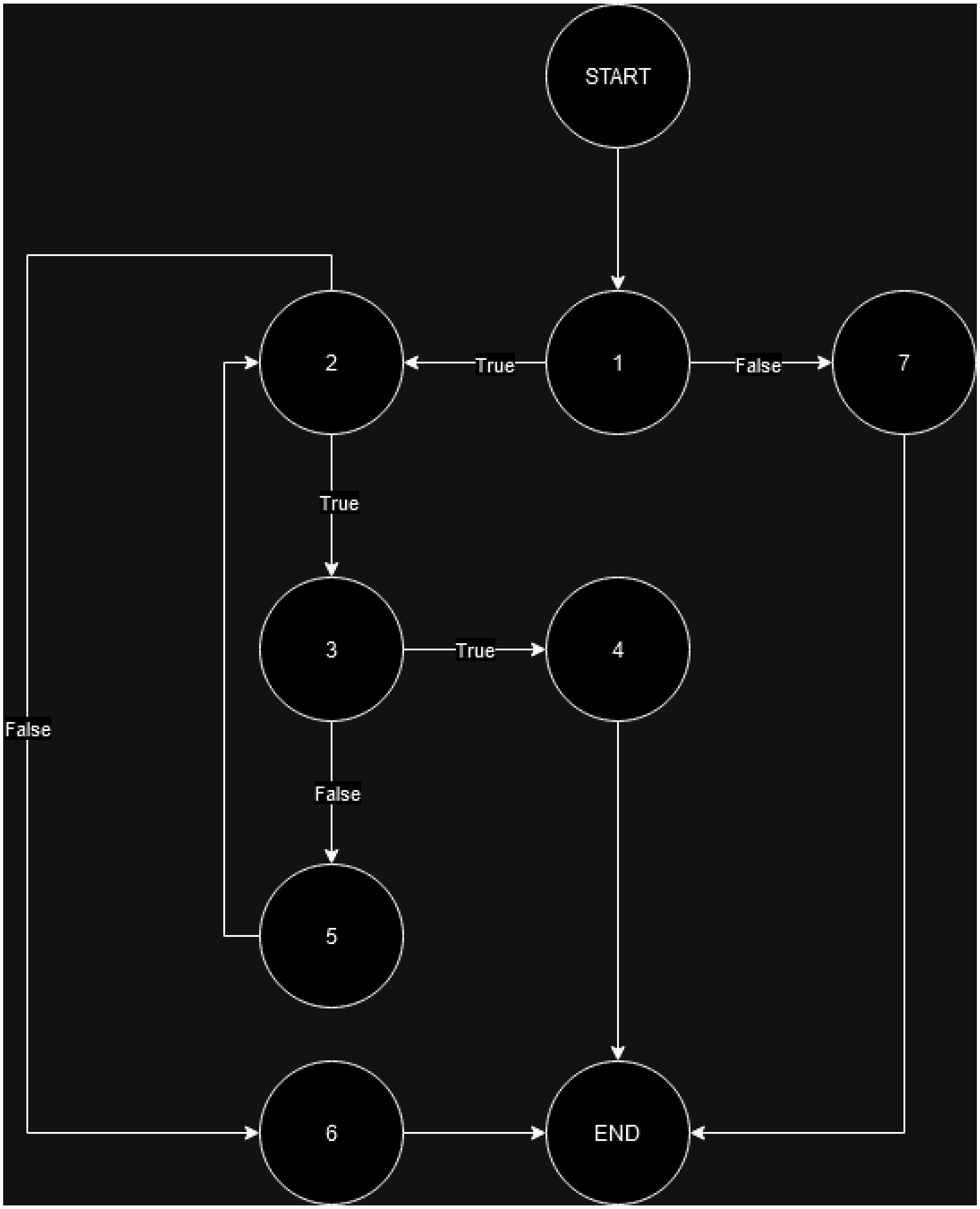

Function 12:

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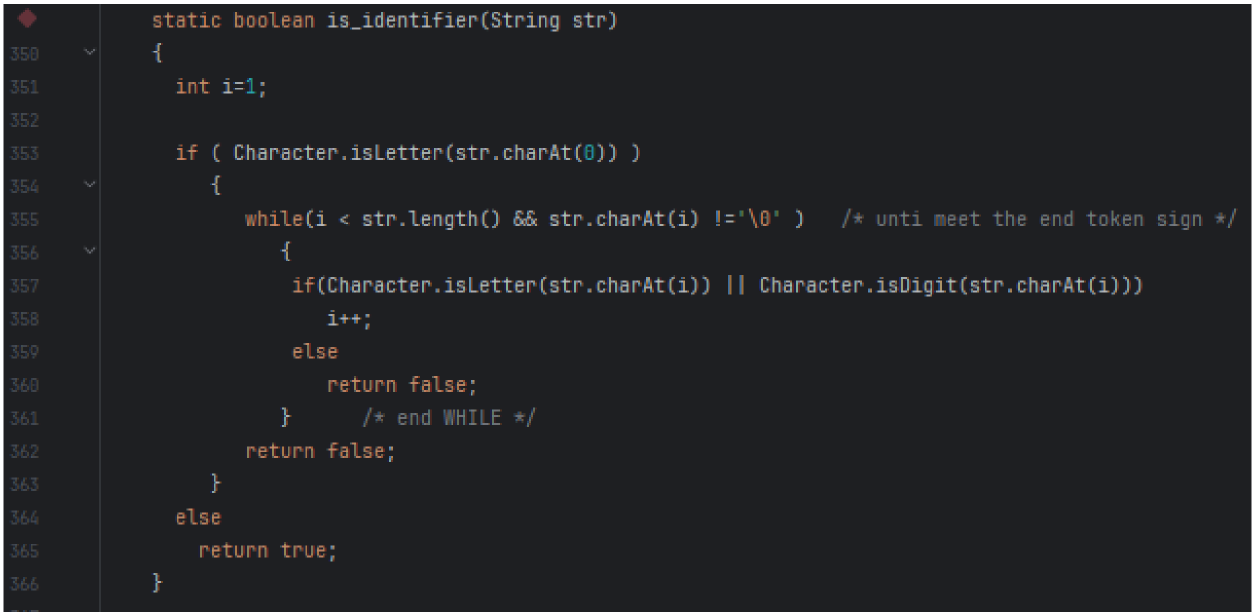
12. boolean is_identifier(String str)



```
        static boolean is_identifier(String str)
350     {
351       int i=1;
352
353       if ( Character.isLetter(str.charAt(0)) )
354          {
355             while(i < str.length() && str.charAt(i) !='\0' )   /* unti meet the end token sign */
356                {
357                 if(Character.isLetter(str.charAt(i)) || Character.isDigit(str.charAt(i)))
358                    i++;
359                 else
360                    return false;
361                }      /* end WHILE */
362             return false;
363          }
364       else
365         return true;
366     }
```

Block Numbers	Line Numbers
1	351,353
2	355
3	357
4	358
5	360
6	362
7	365

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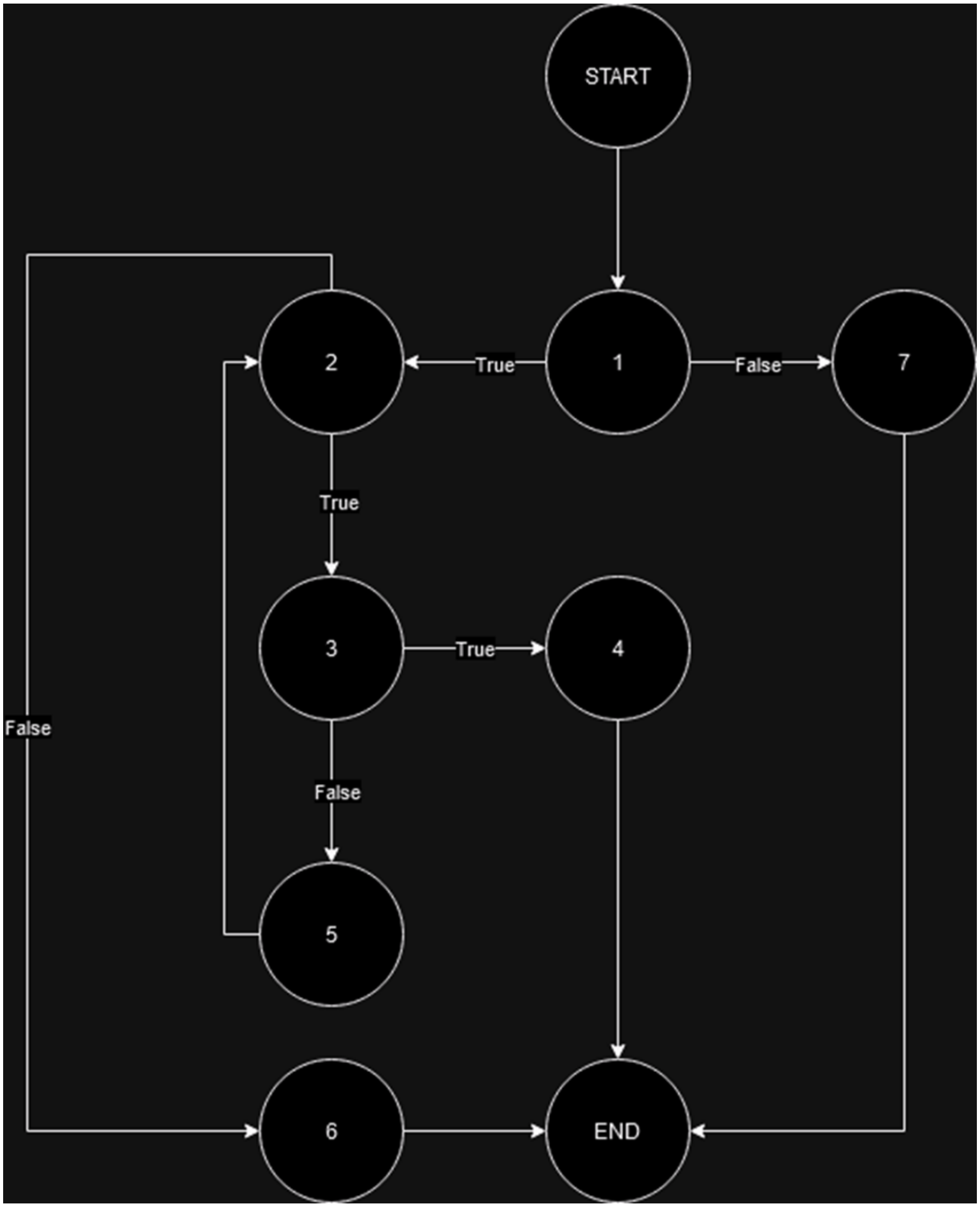

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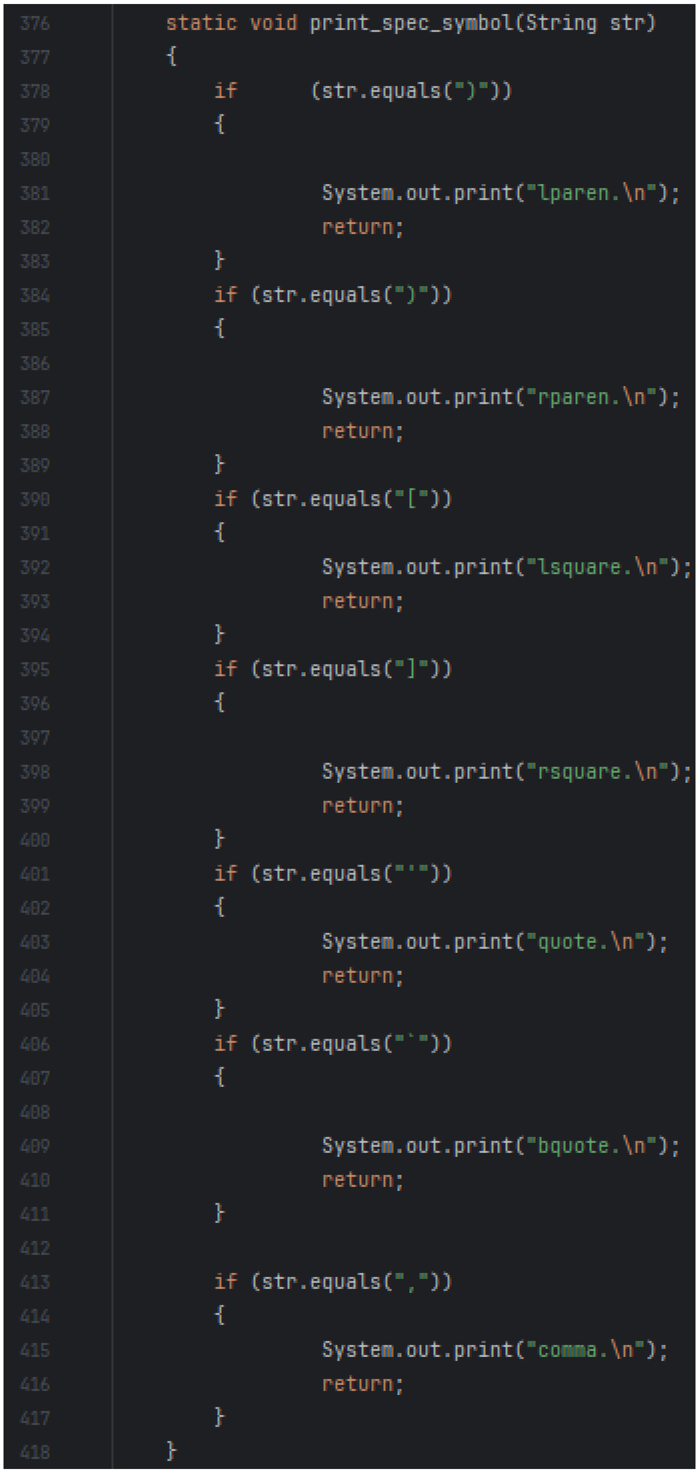
<u>Function 13:</u>

13. void print_spec_symbol(String str)



```java
376     static void print_spec_symbol(String str)
377     {
378         if      (str.equals(")"))
379         {
380
381                  System.out.print("lparen.\n");
382                  return;
383         }
384         if (str.equals(")"))
385         {
386
387                  System.out.print("rparen.\n");
388                  return;
389         }
390         if (str.equals("["))
391         {
392                  System.out.print("lsquare.\n");
393                  return;
394         }
395         if (str.equals("]"))
396         {
397
398                  System.out.print("rsquare.\n");
399                  return;
400         }
401         if (str.equals("'"))
402         {
403                  System.out.print("quote.\n");
404                  return;
405         }
406         if (str.equals("`"))
407         {
408
409                  System.out.print("bquote.\n");
410                  return;
411         }
412
413         if (str.equals(","))
414         {
415                  System.out.print("comma.\n");
416                  return;
417         }
418     }
```

Block Numbers	Line Numbers

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1	378
2	381,382
3	384
4	387,388
5	390
6	392,393
7	395
8	398,399
9	401
10	403,404
11	406
12	409,410
13	413
14	415,416

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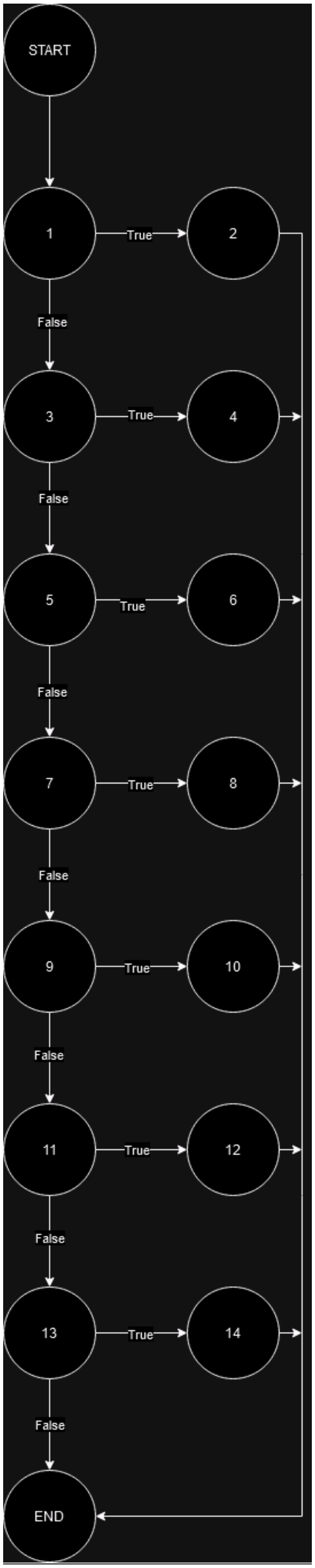

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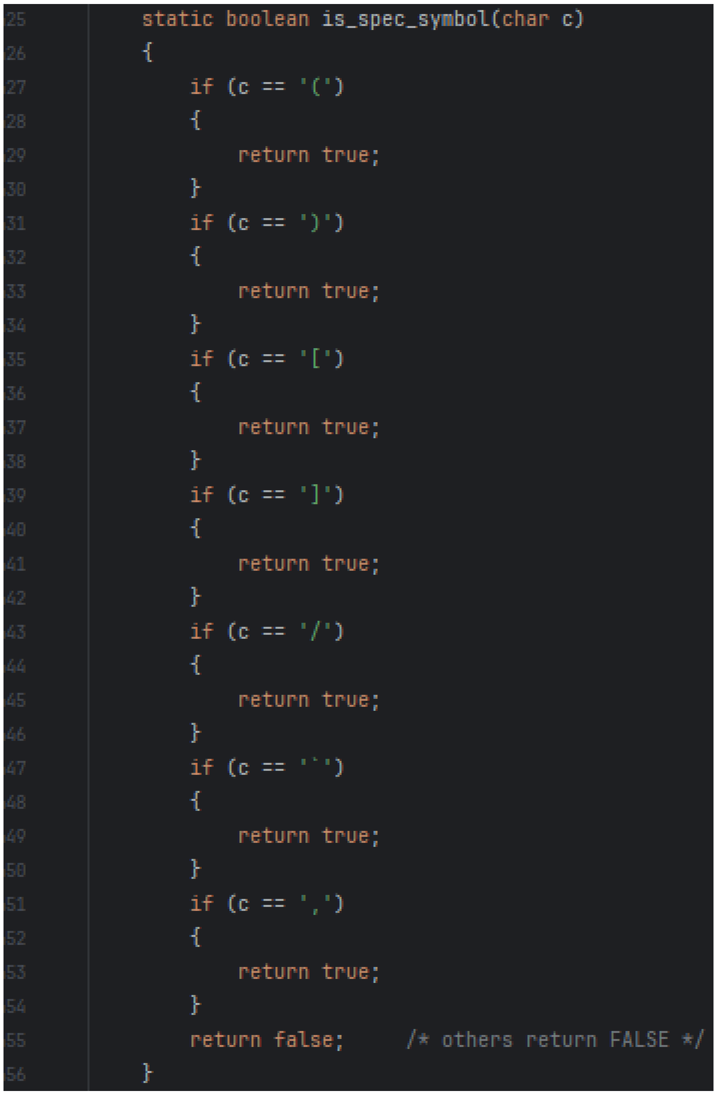
Function 14:

14. boolean is_spec_symbol(char c)



```
static boolean is_spec_symbol(char c)
{
    if (c == '(')
    {
        return true;
    }
    if (c == ')')
    {
        return true;
    }
    if (c == '[')
    {
        return true;
    }
    if (c == ']')
    {
        return true;
    }
    if (c == '/')
    {
        return true;
    }
    if (c == '`')
    {
        return true;
    }
    if (c == ',')
    {
        return true;
    }
    return false;      /* others return FALSE */
}
```

Block Numbers	Line Numbers
1	427
2	429
3	431
4	433
5	435
6	437
7	439
8	441
9	443
10	445
11	447

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12	449
13	451
14	453
15	455

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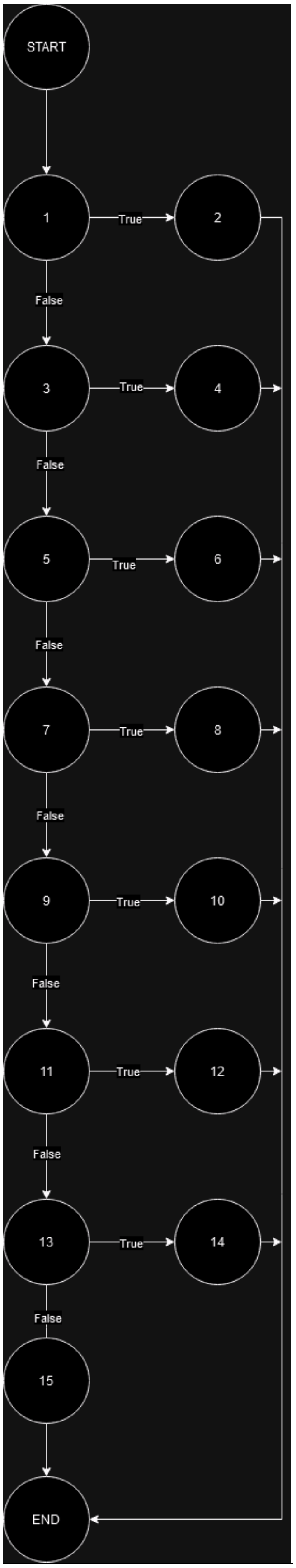

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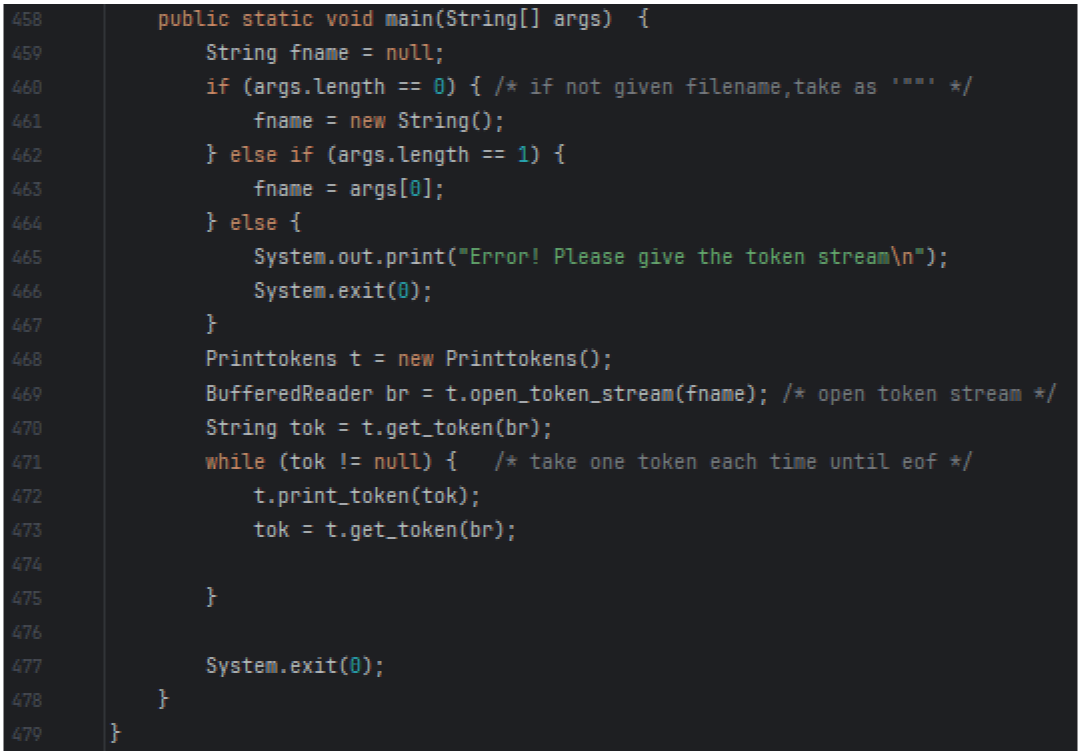
<u>Function 15:</u>

15. void main(String[] args)



```
458     public static void main(String[] args)  {
459         String fname = null;
460         if (args.length == 0) { /* if not given filename,take as '""' */
461             fname = new String();
462         } else if (args.length == 1) {
463             fname = args[0];
464         } else {
465             System.out.print("Error! Please give the token stream\n");
466             System.exit(0);
467         }
468         Printtokens t = new Printtokens();
469         BufferedReader br = t.open_token_stream(fname); /* open token stream */
470         String tok = t.get_token(br);
471         while (tok != null) {   /* take one token each time until eof */
472             t.print_token(tok);
473             tok = t.get_token(br);
474
475         }
476
477         System.exit(0);
478     }
479 }
```

Block Numbers	Line Numbers
1	459,460
2	461
3	462
4	463
5	465,466
6	468,469
7	470
8	471
9	472
10	473
11	477

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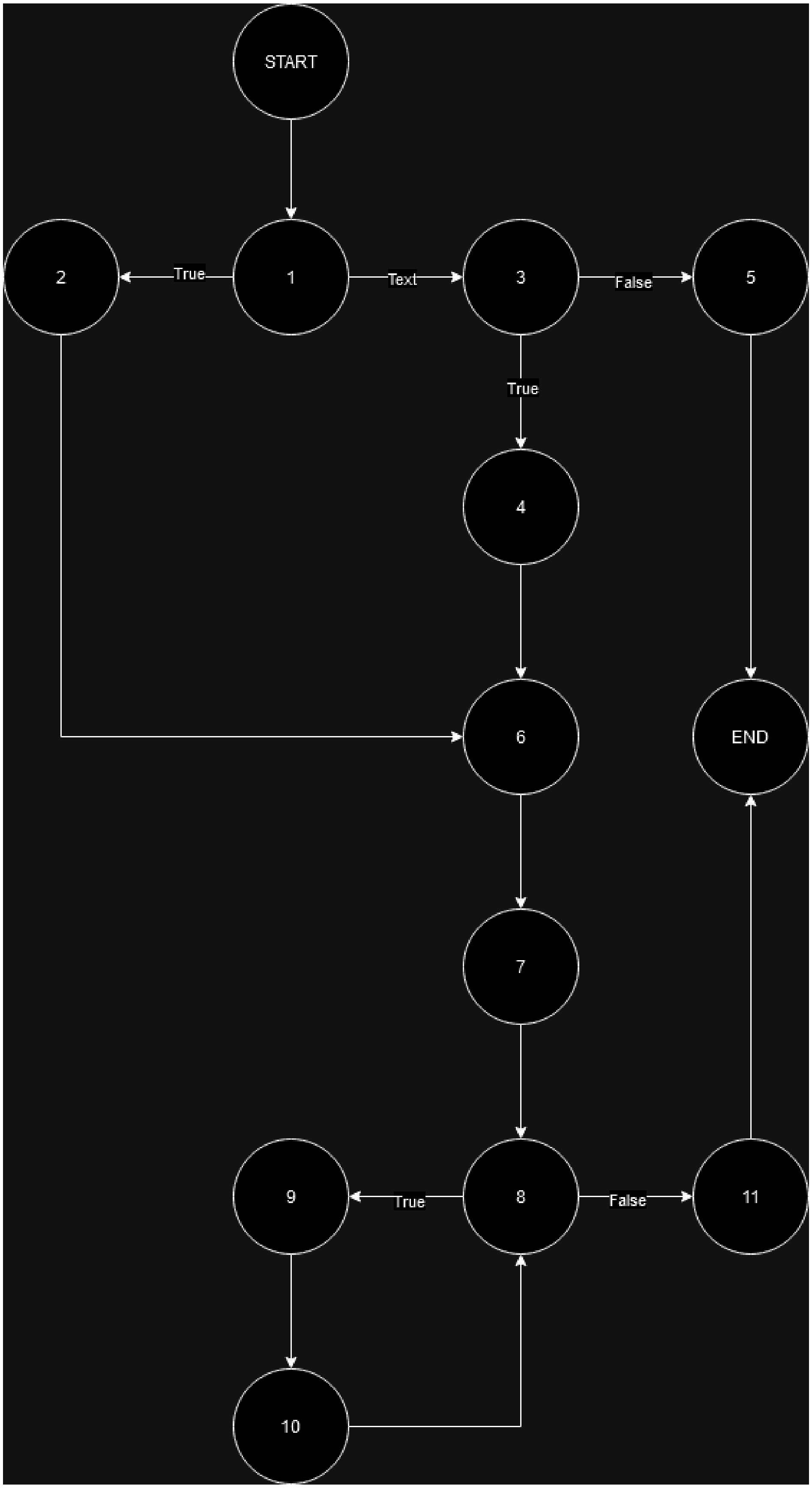
CFG Document


START
1
2
True
Text
3
False
5
True
4
6
END
7
8
9
True
False
11
10