GATE

Computer Science & Information Technology

Compiler Design

DPP

Introduction and Lexical Analysis

Q1 Consider the following C program:

```
int main ( )
{
/*finding maximum element out of a & b*/
int a, b, max;
a = 10; b = 20;
if (a < b)
        max = b;
else
        max = a;
return (max);
}
```

Calculate the total number of tokens present in the program?

Q2 Consider the following C-program:

```
1. int main( )
2. {
3. x = a + b* c;
4. y = x + a ;
5. char f = 'e' ;
6. in t g = 200;
7. ch/* comment ar = "gate";
8. }
```

Which of the following is correct regarding above program?

(A) The given program has 47 tokens.

(B) Given program produces compilation error

(C) Given program produces lexical error

(D) No error produced by program

Q3 Compiler's first phase makes use of following patterns for token (S_1,S_2,S_3) recognition over the alphabet a,b,c.

S_1: b#(b|a)*c

S_2: c#(c|b)*a

S_3: a#(b|c)*b

Note: x# means 0 or 1 occurrence of the symbol x. The analyzer outputs the token that matched the longest possible prefix of the string. If abbbccccba is processed by first phase of compiler then which one of the following is the sequence of token of output.

(A) S_1, S_2, S_3 (B) S_1, S_2

(C) S_3, S_2 (D) S_3, S_3

Q4 How many of the following strings are said to be tokens in C-language without looking at next input character?

(i) ; (ii) return

(iii) int (iv) (

(v) && (vi) >>

Q5 Consider the following C-program:

```
int main ( )
{
    int x; /* comment */
    x = = = y /*abcd***/*abcd*/;
    int **p;
    int b = 10, y;
    x = *p ++ + ++ y;
}
```

How many tokens are present in the given program?

Q6 Consider the following code:

```
main ()
 {
      x = a/b + c;
      y = c – a;
      x = a + d;
      y = d/c + b;
}
```

Calculate the total number of token in the above code.

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Q7 Which of the following operations can be performed on symbol table.

(A) Allocate
(B) Insert
(C) Free
(D) Temp.

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Answer Key

Q1	41~41
Q2	(B, C)
Q3	(C)
Q4	2~2
Q5	39~39
Q6	33~33
Q7	(A, B, C)

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Hints & Solutions

Q1 Text Solution:

The total tokens in the program are:

int(1) main(2) (3))(4)
{(5)

/* finding maximum element out of a &b */

int(6) a(7) ,(8) b(9) ,(10) max(11) ;(12)
a(13) =(14) 10(15) ;(16) b(17) 20(19) ;(20)
if(21) (22) a(23) <(24) b(25))(26)
max(27) =(28) b(29) ;(30)
else(31)
max(32) =(33) a(34) ;(35)
return(36) (37) max(38))(39) ;(40)
}(41)

Total token in above program are: 41

Q2 Text Solution:

The given program generates compilation and lexical error.

Therefore, option b, c are correct.

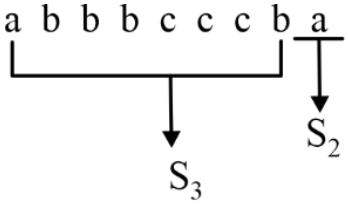
Q3 Text Solution:

Minimum string of S_1: c

Minimum string of S_2: a

Minimum string of S_3: b

It is given that prefer longest matching. So,



Therefore, option (c) is correct answer.

Q4 Text Solution:

Among all of the above; , (are the only token for whom we need not to check next input character. return can have next input character as returna which could be a variable name, similarly int. && can be **&&=** Similarly, >> could be **>>=**

Q5 Text Solution:

The given program is:

int(1) main(2) (3))(4)
{(5)
int(6) x(7) ;(8) /*comment*/
x(9) ==(10) =(11) y(12) /*abcd***/ *(13) abcd(14) *(15) /(16) ;(17)
int(23) b(24) =(25) 10(26) ,(27) y(28) ;(29)
x(30) =(31) *(32) p(33) ++(34) +(35) ++(36) y(37) ;(38)
}(39)

There are total 39 tokens in program.

Q6 Text Solution:

main(1) (2))(3)
{(4)
x(5) =(6) a(7) /(8) b(9) +(10) c(11) ;(12)
y(13) =(14) c(15) −(16) a(17) ;(18)
x(19) =(20) a(21) +(22) d(23) ;(24)
y(25) =(26) d(27) /(28) c(29) +(30) b(31) ;(32)
}(33)

Q7 Text Solution:

Allocate → Allocate function is used to allocate a new empty symbol table.

Insert → It is used insert a name in a symbol table and return a pointer to its entry.

Free → Free function is used to remove all entries and free storage of symbol table.