GANPAT UNIVERSITY
U. V. PATEL COLLEGE OF ENGINEERING
B.TECH VII CE/IT
ACADEMIC YEAR: JULY-DEC 2020
2CE701/2IT701: COMPILER DESIGN
ASSIGNMENT 1

1. Perform macro expansion on the following code:

```
#define square (x) ((x) * (x))
main( )
{
        int num = square(5);
}
```

2. Discuss action taken by every phase of compiler on the following string:

   Sum = OldSum – Value /100

3. Identify and eliminate useless symbol from the following grammar:

S → AC | SB A → bASC | a B → aSB | BbC C → Bc |ad	A→ xyz | Yyzz X → Xz | xYx Y → yYy | XZ Z → Zy |z	S → AB | CA B → BC | AB A → a C → aB |b

4. Identify and eliminate unit production from the following grammar:

   S → ABCd | ABd | ACd | BCd | Ad | Bd | Cd | d
   A → BC | B | C
   B → bB | b
   C → cC | c

5. Identify and eliminate NULL production from the following grammar:

S → AaA A → Sb | bCC | ϵ C → CC | abb	S → aAB | dA A → bAc | ϵ B → dB | ϵ	S → ABC A →aA | ϵ B → bB | ϵ C → c

6. Identify and remove left recursion from the grammar:

S → aBDh B → Bb | c D → EF E → g | ϵ F → f | ϵ	A→ Ab |AAb | bA | a	S → ABC A → Aa | d B → Bb | e C → Cc | f

7. Convert following program code into 3 address code.

```
1 int a[10], b[10], dot_prod, i;
  dot_prod = 0;
  for (i=0; i<10; i++) dot_prod += a[i]*b[i]
```

2
```
int a[10], b[10], dot_prod, i; int* a1; int* b
dot_prod = 0; a1 = a; b1 = b;
for (i=0; i<10; i++) dot_prod += *a1++ * *b1++
```

3
```
x=1;
y=x+10;
while (x<y) {
    x=x+1;
    if (x%2==1) then y=y+1;
    else y=y-2;
}
```

8. For following source code, generate 3 address code, basic block and control flow graph.

1
```
unsigned int fib(m)
   unsigned int m;
{  unsigned int f0 = 0, f1 = 1, f2, i;
   if (m <= 1) {
      return m;
   }
   else {
      for (i = 2; i <= m; i++) {
         f2 = f0 + f1;
         f0 = f1;
         f1 = f2;
      }
      return f2;
   }
}
```

2
```
int A[5],x,i,n;
for (i=1; i<=n; i++) {
   if (i<n) {
      x = A[i];
   } else {
      while (x>4) {
         x = x*2+A[i];
      };
   };
   x = x+5;
}
```

9. Consider the following C code:

```
void bar(){
La: i=1;
L0: if (i > n) goto L1;
Lb: j=1;
Lc: goto L2;
L1: j=2;
L2: k = 3;
Ld: if (n > 0) goto L3
L4: p++
Lf: if (p > 10) return;
Lg: k++;
Li: goto L4
L3: if (m > 0) return;
Lh: k--
Lk: goto L0
}
```

The number of basic-blocks in the CFG of the above code are: _____

10. Consider the following code: optimize code by applying various code optimization techniques.

1.	2.

foo(int p){
int x=3, y=4, z;
if (bar(p)) {
z = x + 1;
} else {
z = y;
}
return z;
}
	if (a && true)
	b = a * 1;
	else
	z = c + 0;

Note: Write Enrollment number, name and class on the first page of your assignment and submit scan copy of it on Moodle on or before 11th Sept. 2020.