Department of Computer Science and Engineering
Indian Institute of Technology, Kharagpur

Compiler Theory: CS31003
3rd year CSE, 5th Semester

Assignment - 7: Target Code Generation *Marks: 10*
Assign Date: October 21, 2020 Submit Date: 10:55, October 28, 2020
Mode: Individual Submission

1. Consider the following C code and Three Address Code (TAC),

```
int a[10], c[10];
int n=10, i;

for(i=0; i<n; i++){
    if(a[i]%2 == 0)
        c[i]=0;
    else
        c[i]=1;
}
return ;
```

```
100: t1 = 10
101: n = t1
102: t2 = 0
103: i = t2
104: if i < n goto 109
105: goto 125
106: t3 = i
107: i = t3 + 1
108: goto 104
109: t4 = 4 * i
110: t5 = a[t4]
111: t6 = t5 % 2
112: t7 = 0
```

```
113: if t6 = t7 goto 115
114: goto 120
115: t8 = 4 * i
116: t9 = c + t8
117: t10 = 0
118: *t9 = t10
119: goto 106
120: t11 = 4 * i
121: t12 = c + t11
122: t13 = 1
123: *t12 = t13
124: goto 106
125: return
```

   Optimize the Three Address Code using Peep-hole Optimization and write the optimized Three Address Code along with intermediate step where all potential removals are marked and recomputed quad numbers are shown. 5

2. (a) Write a lines of code, which prepares the stack and registers for use within the function.
   (b) Write a lines of code, which restores the stack and registers to the state they were in before the function was called. 2

3. Consider the following C code and optimized Three Address Code (TAC),

```
int countEven(int a[], int n){
    int i, count = 0;
    for(i=0; i<n; i++){
        if(a[i]%2 == 0)
            count++;
    }
    return count;
}
```

Optimized Three Address Code :

```
000:                                    //      ?
001:        count = 0                   //      ?
002:        i = 0                       //      ?
003:    L0: if i < n goto L2            //      ?
004:        goto L3                     //      ?
005:    L1: i = i + 1                   //      ?
006:        goto L0                     //      ?
007:    L2: t0 = 4 * i                  //      ?
008:        t1 = a[t0]                  //      ?
009:        t2 = t1 % 2                 //      ?
010:        if t2 != 0 goto L1          //      ?
011:        count = count + 1           //      ?
012:        goto L1                     //      ?
013:    L3: return count                //      ?
```

Write the list of live variables for each line of TAC and draw an interval graph to keep track of liveness information of all variables. 3

Note: Please submit your answer handwritten in paper. Upload your answer in .pdf format in the moodle server. File name should be named as ass7_roll.pdf, where "roll" is your roll number.