

Note: No marks will be given if the justification for your answer is not provided.

1. From the following regular expression construct a DFA directly (using firstpos, lastpos and followpos), without skipping any step. Show every intermediate data structure, tables, and their values while creating the DFA. 10

$(a|b)^*abb(c|d)^*$

2. Formally prove that WCW^R , where $W \in \{0,1\}^*$ and W^R is the reverse of W , is not regular. 10

3. Consider the following grammar and write a pseudo code to implement it using recursive descent parsing technique .

Output should be accept or reject in the code level. 10

$P \rightarrow S ; P \mid \epsilon$

$S \rightarrow \text{do } P \text{ while } (B) \mid S$

$S \rightarrow \text{if } (B) \ S$

$S \rightarrow \text{break}$

$S \rightarrow \text{continue}$

$S \rightarrow \text{id} = E$

$E \rightarrow E + E$

$E \rightarrow \text{id}$

$B \rightarrow B < B$

$B \rightarrow \neg(B)$

$B \rightarrow \text{id}$

$B \rightarrow B \ \&\& \ B$

4. Using Thompson Construction Method, build an NFA for the following regular expression without skipping any step. You MUST name the states as 0,1,2,3,... 10

$(0 + 1)^*0((0 + 1)(0 + 1)(0 + 1))^*0(0 + 1)^*$

5. Consider the following two programs and proof that two programs are semantically equivalent. 20

```
int i=0,k,m,n;
while (i<=10){
    m=m+10;
    n=n+10;
    i++;
}
k=m+n;
```

(a)

```
int i=j=0,k,m,n;
while (i<=10){
    m=m+10;
    i++;
}
while (j<=10){
    n=n+10;
    j++;
}
k=m+n;
```

(b)

Figure 1: (a)Source program and (b) Transformed program.