Problem 5

```
CHANGE(n, V, D)
FOR v = 0 TO V
    M[0, v] ← 0
FOR i = 1 TO n
    FOR v = 0 TO V
        IF (Di > v)
            M[i, v] ← M[i – 1, v].
        ELSE
            M[i, v] ← min { M[i – 1, v], 1 + M[i – 1, v – Di] }.
combinations = []
start = V
i = n
WHILE (start != 0 )
    IF M[i, start] == M[i-1, start]
        i = i – 1
    ELSE
        combinations ← Di
        start = start – Di
return combinations
```

Discussing optimality:

Assistance taken from slides

M[i, v] = optimal number of coins with denomination 1,….i subjected to limit V

Goal = M[i, V]

Case 1: item i is not selected then the best of {1,2,3…, i-1} are selected subject to limit V

Case 2 : item i selected then,

V = V – Di

number of coins ++

then the best of {1,2,3…, i-1} are selected subject to limit V

So due to exchange argument, these substructures are optimal, hence, making the whole solution optimal.