ODD 2021
Tutorial Sheet - 2

Software Development Fundamentals – I (15B11CI111)

Q1. [CO3] Find out the minimum count of races required to identify three fastest horses, if count of horses is 25 and at a time only 5 horses can participate in a race. Also, you do not have the accessibility to watches

Sol:

In first five races (R1 to R5), we can find fastest, 2nd fastest, and 3rdfastest of each race say as follows:

R(race no,1), R(race no,2), R(race no,3)

e.g. R(1,1), R(1,2), R(1,3), R(2,1),R(2,2),R(2,3) etc.

Race 6: race among fastest horses of R1 to R5, *i.e.*R(1,1), R(2,1), R(3,1), R(4,1), and R(5,1)

Say, the ranking (first to fifth) in Race 6 are as follows: R(1,1), R(2,1), R(3,1), R(4,1), and R(5,1)

We can infer/conclude following after Race 6

- This indicates, we don't need now to explore the horses of race 4 and race 5 because fastest horses of these races are at 4th and 5th places in the race of fastest horses of each race.
- We don't need to explore 2nd to 5th ranked horses of race 3, as the fastest horse of race 3, i.e. R(3,1) is the third fastest horse in the race of fastest horses of each race.
- We don't need to explore 3rd to 5th ranked horses of race 2 as the fastest horse of race 2, i.e. R(2,1) is the second fastest horse in the race of fastest horses of each race. So, we need to explore fastest and second fastest horses of race 2.
- We need to explore, 2nd and 3rd fastest horses of race 1 too because, fastest horse of race 1, i.e. R(1,1) is the fastest horse in the race of fastest horses of each race.

Race 7: R(1,2), R(1,3),R(2,1), R(2,2), R(3,1)

Q2. [CO3] Let us modify the Fake Coin puzzle as follows: 8 coins are given, out of which 1 coin is fake; you do not know whether the fake coin is lighter or heavier than the genuine coin. You have accessibility of two pan weighing machine without weights. Identify the minimum count of required weighing to identify the fake coin

Sol:

Weights of 8 coins C1, C2, .. C8 are W1, W2, .. W8. One coin is fake and we don't know whether it is lighter or heavier.
Weighing 1: compare, (W1+W2+W3) with (W4+W5+W6)

Two possibilities:
P1: (W1+W2+W3) = (W4+W5+W6)
P2: (W1+W2+W3) ≠ (W4+W5+W6)

If, P1: then
Weighing 2: compare, W1 with W7.
If, W1 = W7, then W8 is fake
If, W1 ≠ W7, then W7 is fake
So in two weighing, we can identify the fake coin if we encounter P1 after Weighing 1

If, P2 *i.e.* (W1+W2+W3) ≠ (W4+W5+W6), then,

Weighing 2: compare, W1 and W2
Two possibilities:
P3: W1 = W2
P4: W1 ≠ W2
Weighing 3: compare, W4 and W5
Two possibilities:
P5: W4 = W5
P6: W4 ≠ W5

If P3 and P5:

Weighing 4: compare, W1 with W7.
If, W1 = W7, then W8 is fake
If, W1 ≠ W7, then W7 is fake

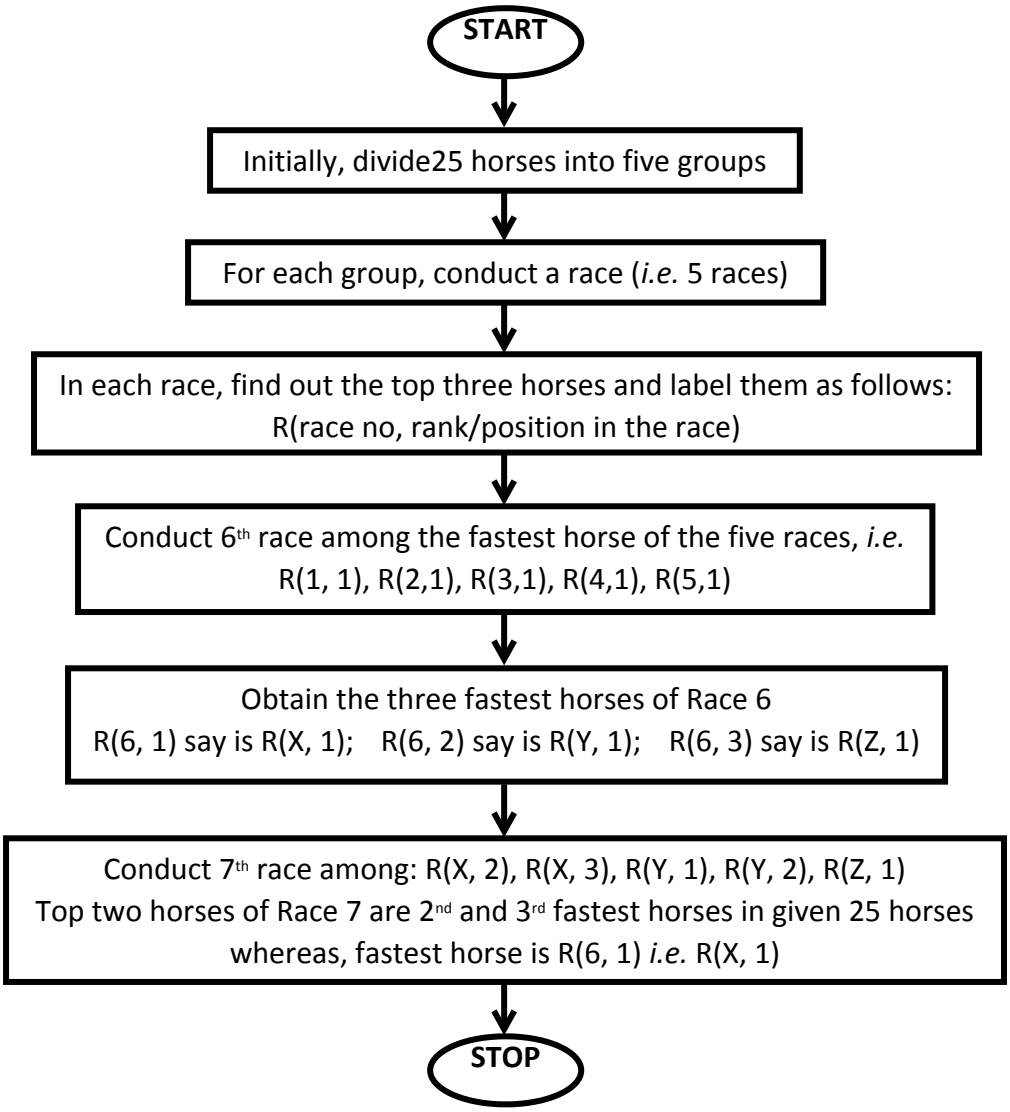
If P4:

Weighing 4: compare, W1 with W7.
If, W1 = W7, then W2 is fake
If, W1 ≠ W7, then W1 is fake

If P6:

Weighing 4: compare, W4 with W7.
If, W4 = W7, then W5 is fake
If, W4 ≠ W7, then W4 is fake

Q3. [CO3] Constrained with, no accessibility to watches, draw the flow chart to find out the minimum count of races required to find three fastest horses, if count of horses is 25 and at a time only 5 horses can participate in a race



Q4. [CO3] You have three jugs/containers (without marker) named as A, B, and C with capacities as 8 litres, 5 litres, and 3 litres respectively. The 8 litres jug is full of water whereas other two are empty jugs. Without weighing the jugs, it is desired to put 4 litres water into jug B with minimum number of steps

Sol:

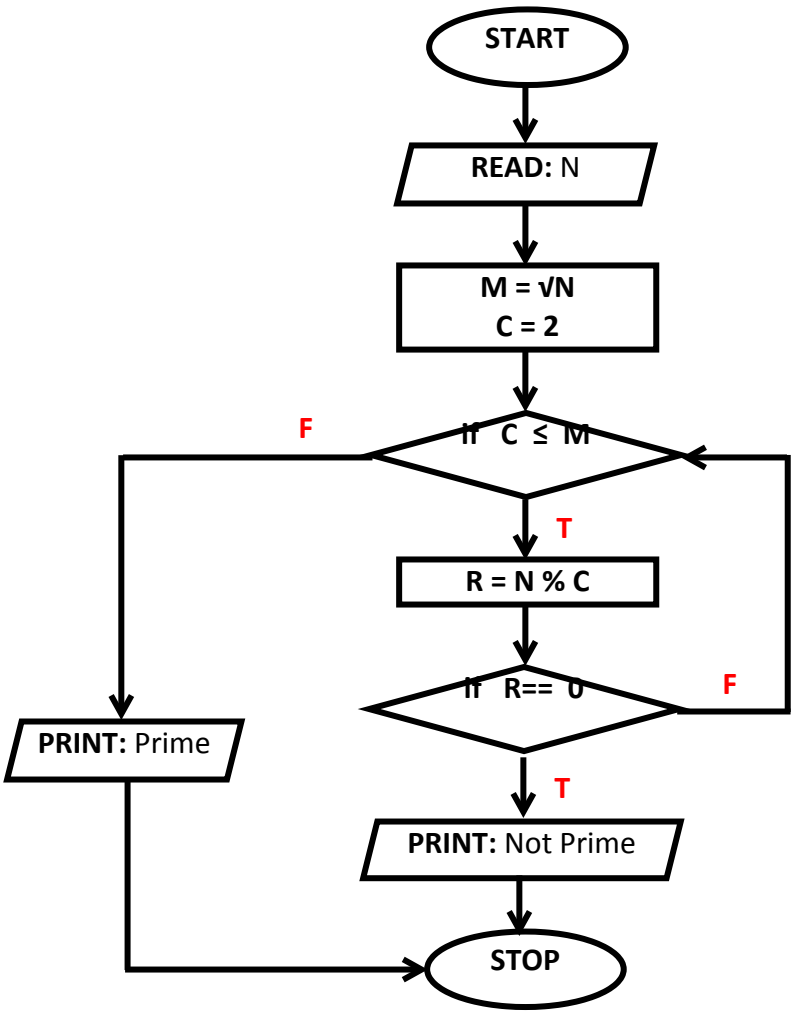
Capacity:	A = 8L;	B = 5L;	C = 3L
Given:	A = Full = 8L;	B = Empty = 0L;	C = Empty = 0L
Step 1: B← A;	B = Full = 5L;	A = 3L	
Step 2: C ← B;	C = Full = 3L;	B = 2L;	A = 3L
Step 3: A ← C;	C = Empty = 3L;	B = 2L;	A = 6L
Step 4: C ← B;	C = 2L;	B = Empty = 0L;	A = 6L
Step 5: B ← A;	C = 2L;	B = 5L;	A = 1L
Step 6: C ← B;	C = 3L;	B = 4L;	A = 1L

Q5. [CO3] Covering all the requirements of the Snake & Ladder game, draw the flow chart

Sol:Students are supposed to do by themselves and their solutions to be discussed

Q6. [CO3] Draw the flow chart to verify whether the user inputted number is a prime number or not

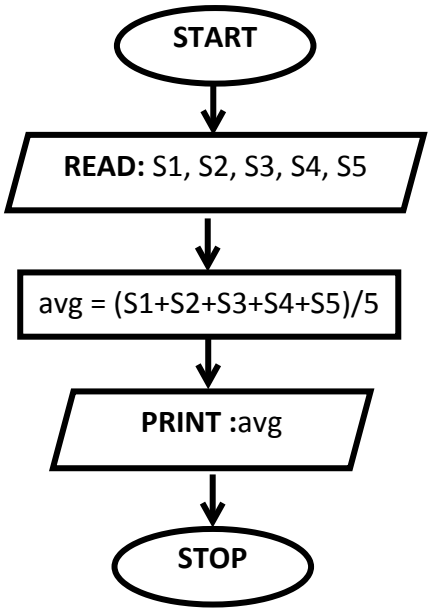
Sol:



Q7. [CO3] It is desired to compute the average and total marks of a student in five subjects. Draw the flow chart and write C program to input the marks obtained in five subjects and display the average and total marks

Sol:

```
#include<stdio.h>
int main()
{
        int S1, S2, S3, S4,S5;
        floatavg;
        printf("Marks obtained in each of the five subjects");
        scanf("%d%d%d%d%d", &S1, &S2, &S3, &S4, &S5);
        avg = (S1+S2+S3+S4+S5)/5;
        printf("Average marks is = %f", avg);
        return 0;
}
```



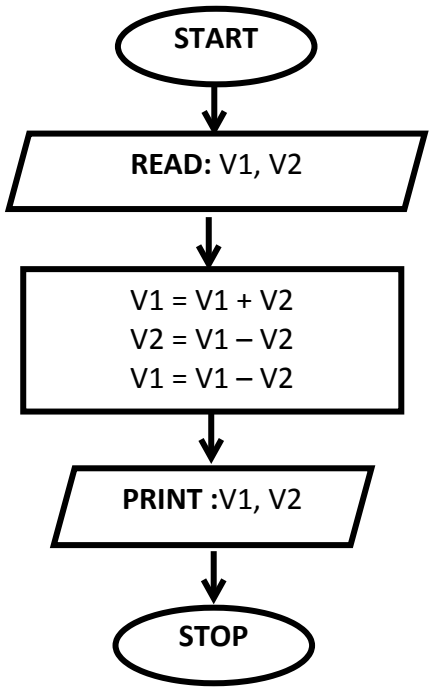
Q8. [CO3] Draw the flow chart and write C program to swap the values of two variables without using the third variable

Sol:

```
#include<stdio.h>
int main()
{
        int V1, V2;
        printf("Enter two variables");
        scanf("%d%d", &V1, &V2);

        V1 = V1+V2;
        V2 = V1 – V2;
        V1 = V1 – V2

        printf("After swapping V1 = %d and V2 = %d", V1, V2);
        return 0;
}
```



Q9. [CO3]Let us create a magic square of3×3 square grids by placing distinct numbers in the range between 5 and 13. Which one of the following is the sum of the values present in each column or each row, or each corner to corner diagonal?

- **A.** 38
- **B.** 32
- **C.** 30
- **D.** None of the listed options