B05E325L

VIT
Vellore Institute of Technology

SCOPE - Winter 2023-24 - CAT – II - SLOT: A1+TA1

Question (5X10=50 Marks)

1. Using relevant **real life examples**, **investigate** how events or signals could be classified as per the following criteria and **provide** sufficient justifications:-
   a. Arrival
   b. Form or Structure
   c. Type (**hint:** what it conveys?)

2. Discover and discuss in details regarding the requirements of real-time embedded systems. **Design and demonstrate** a hybrid scheduler for an embedded system governed by the real time requirements.

Note: Hybrid scheduler must be **illustrated** using sample dataset of your choice, Task **Time line graph**, and the necessary as well as sufficient conditions.

3. For the given datasets, **prove** that EDF gives feasible schedule. **Illustrate** task time-line graph for at least **three cycles**.

Task	Execution Time	Period
T1	5	15
T2	7	10
T3	10	20

Compute the utilization percentage for the following data set using EDF technique and **identify** the parameters required to be manipulated for better utilization and schedulability with proper justifications.

Task	Arrival Time	Execution Time	Period	Deadline
T1	0	5	20	20
T2	5	10	15	15
T3	10	15	10	10

4. Construct the FSM model for the given scenario: -

- ***"Fruit Classifier"***

Specification:

1. **Ambience:**-Agro market with fruit sorting, pricing and packing using multiple robots
2. Baskets of different types
3. Different types of fruits such as watermelon, apple, pomegranate, grapes etc.
4. Mobile robot with 360^0 rotational arm capability

Requirements:

1. Fruits need to be **sorted** based on type, size, quality and weight
2. **Collision avoidance** to be incorporated
3. Relevant **states, events and actions** to be considered

Illustrate the CDFG for the above scenario.

5. Identify as well as analyse the requirements of code optimization in embedded system design.

Apply your findings on the given code snippet to get the optimized code with relevant validations

```
int p;
int q= 50;
int r=100;
for (inti=0; i<200; i++)
{
int w = 25 + 35;
p = q ÷ r;
for (inti=0; i<200; i++)
Temperature[i] = i * 2;

for (inti=0; i<200; i++)
Moisture[i] = i * 3;
}
```

1) Arrival - periodic, Aperiodic, Sporadic
   Jam - Analog & Digital
   Text, Video & Audio

2) Functional correctness
   Timelines
   Stability
   scalability, Cost effectiveness
   Hybrid - LST

3) EDF - Schedulability fails

4) Entity → Event & States
   fruits
   Basket
   Robot → idle, Move forward
   backward, turn right, left, 360°
   Pick, Set Place, halt

5) Memory, Processing, Power - Resources
   Challenges → Time, Space, Scalability, optimization
   optimization techniques

```
int p;
int q = 50;
int r = 100;
int w = 25 + 35;
p = q + r;
{ for (i=0; i<20; i++)
    temp
    work }
```