



VIT

Vellore Institute of Technology
(Declared to be University under section 3 of UGC Act, 1956)

REG.NO.:

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING CONTINUOUS ASSESSMENT TEST - II WINTER SEMESTER 2024-2025

SLOT: A2+TA2

Programme Name & Branch : B.Tech (CSE)
 Course Code and Course Name : BCSE305L- Embedded Systems
 Faculty Name(s) : ALL
 Class Number(s) : ALL
 Date of Examination : 16/03/2025
 Exam Duration : 90 minutes

Maximum Marks: 50

Answer all the questions

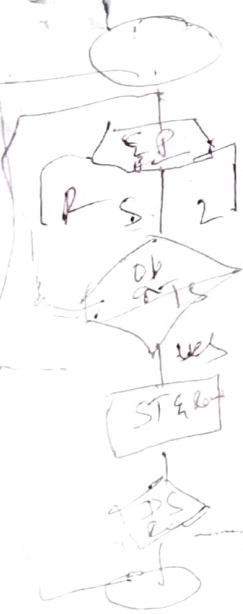
CO3. To examine the working principle and interface of typical embedded system components, create programme models, apply various optimization approaches including simulation environment and demonstration using debugging tools.

states Slow Speed
 Normal
 High
 Idle

Action - Apply
 brakes
 Stop

JL
 TR

Event : obstacle
 GPS
 Traffic signal



Q. No	Question	M	CO	BL
1.	An autonomous car is programmed to move from VIT to CMC, Bagayam, The car will follow all the traffic rules and would be guided by the inbuilt Googlemap. Construct an FSM and a CDFG for the same.	10	3	3
2.	A. Make use of the various optimisation techniques in the given code and present the modified code <pre> #include <stdio.h> int main() { int i, j, isPrime; for (i = 2; i <= 100; i++) { isPrime = 1; printf("Prime numbers up to 100: "); for (j = 2; j < i; j++) { int a=i%j; if (i % j == 0) { isPrime = 0; break; } } if (isPrime) { printf("%d ", i); } } if(isPrime) { printf("\n"); } return 0; } </pre>	6	3	
	B. Differentiate hardware and software development tools with an example for each	4		

Dead code

not required

HFT Logic Analyzer, ST-Debugger, Simulink



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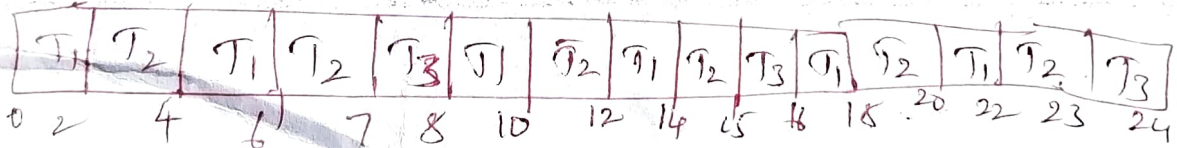
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3.	A car manufacturing industry has various tasks to be carried out. Task 1 takes 2 secs and is repeated every 4 secs, Task 2 takes 3 secs and is carried out every 8 secs. Task 3 takes 4 secs and is repeated every 24 secs. Assume all the tasks arrive at time 0. Schedule the tasks based on any 2 models and analyse the CPU utilization and the constraints for each model with the time graph.	10	3	4
4.	A smart city project has huge data which is collected and used for prediction and analysis. There are 3 processes which happens simultaneously. Build the 3 processes using POSIX and also incorporate scheduling.	10	3	3
5.	A. "All embedded systems are not Real time systems". Justify the same with an example for each.	5	3	3
	B. Identify if the following systems are Soft RTS or Hard RTS with justification 1. A Cruise control system <i>Hard</i> 2. An ATM machine <i>soft & Secur</i> 3. A Pacemaker <i>Hard.</i> 4. A fitbit watch <i>soft</i> 5. A smart fridge <i>soft</i>	5		

3) LCM = 24



EMBEDDED SYSTEMS A2-KEY

1. An autonomous car is programmed to move from VIT to CMC, Bagayam, The car will follow all the traffic rules and would be guided by the inbuilt Googlemap.

Construct an FSM and a CDFG for the same .

1. State A--- Moving in slow speed
2. State B---Moving in Normal speed
3. State C-- Moving in High speed
4. State D- Idle state

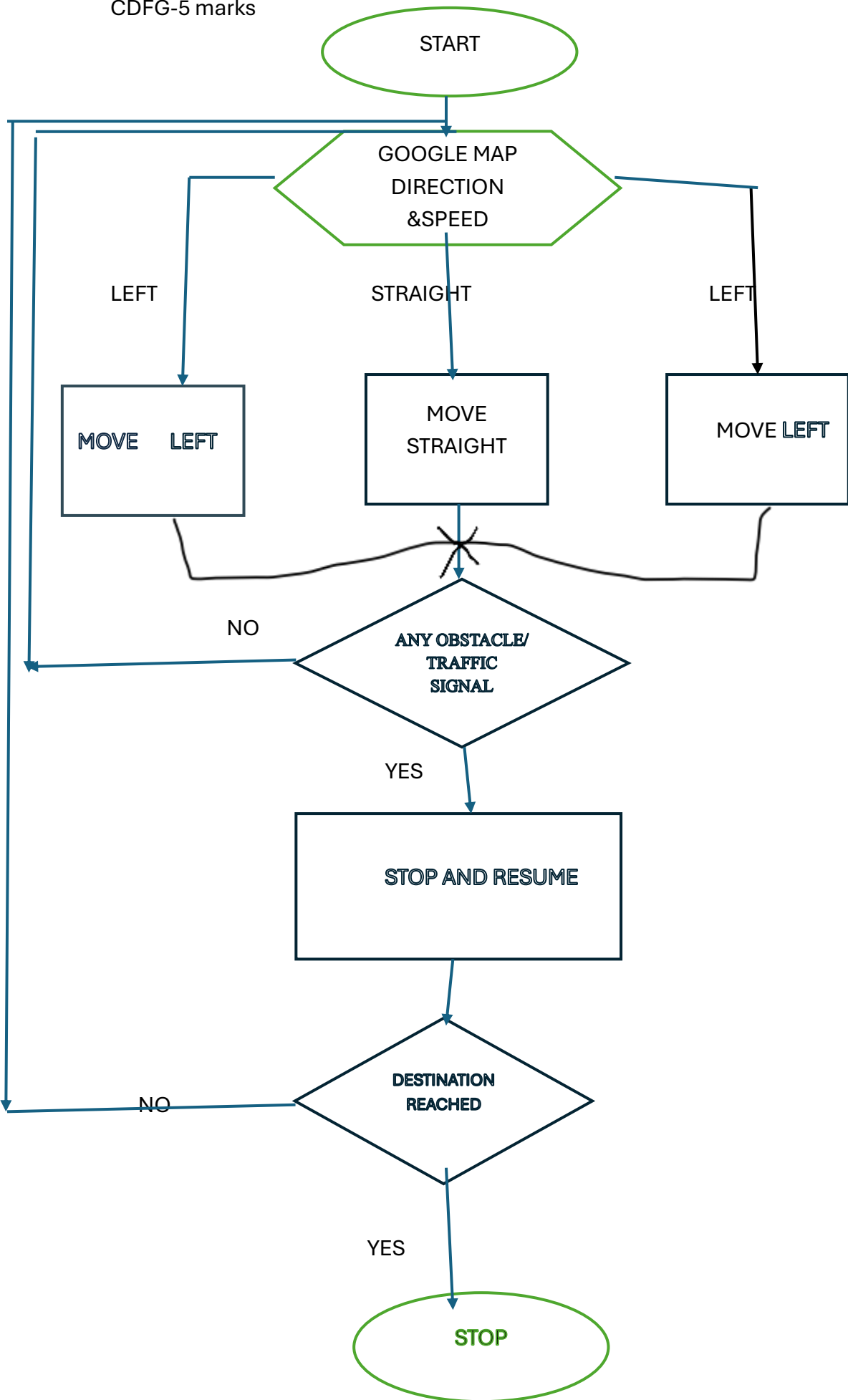
Action :

1. Apply brakes and stop
2. Turn left
3. Turn right

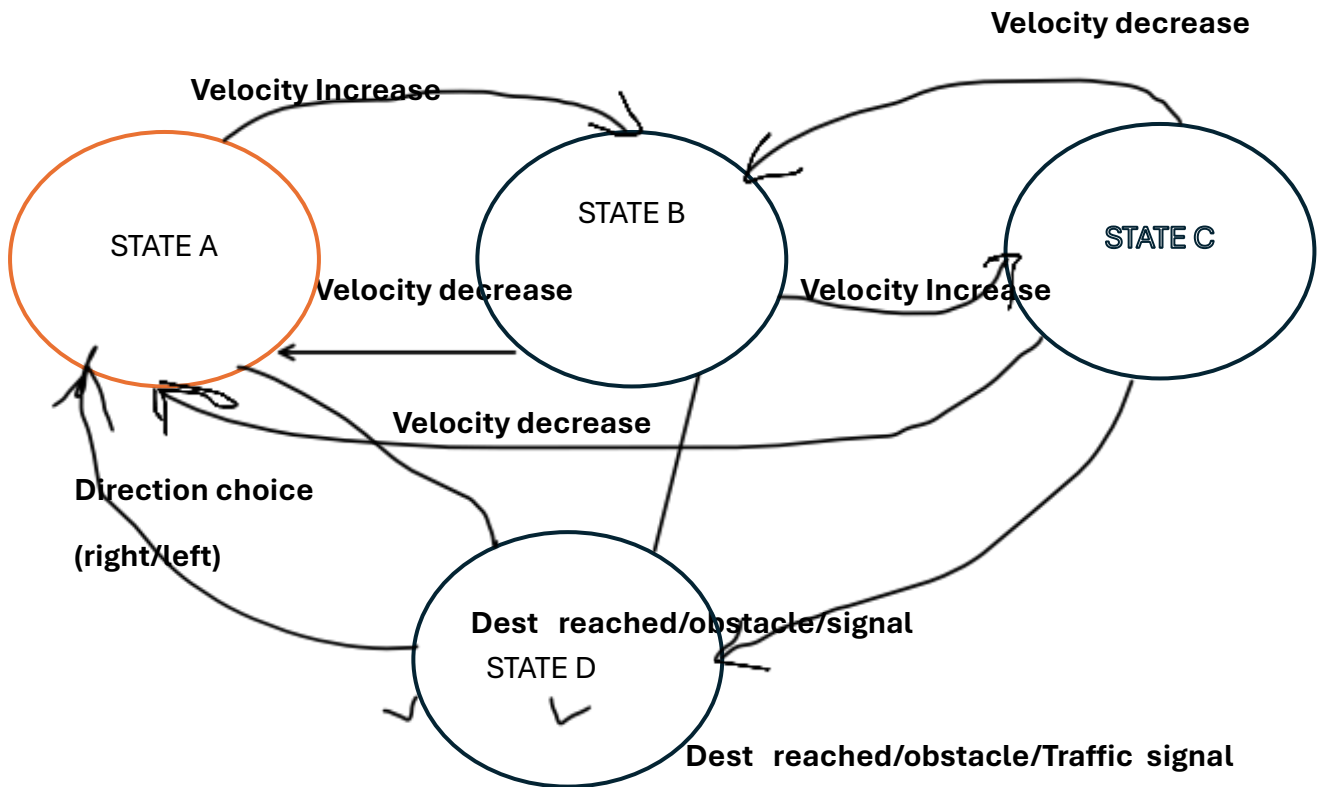
Event:

1. Obstacle
2. Traffic signal
3. GPS signals

CDFG-5 marks



FSM-5 marks



2. A. Make use of the various optimisation techniques in the given code and present the modified code

```
#include <stdio.h>

int main()
{
    int i, j, isPrime;
    for (i = 2; i <= 100; i++)
    {
        isPrime = 1;
        printf("Prime numbers up to 100: ");
        for (j = 2; j < i; j++) {
            int a=i%j;
```

```

        if (i % j == 0) {
            isPrime = 0;
            break;
        }
    }
    if (isPrime) {
        printf("%d ", i);
    }
}
if(isPrime)
{
printf("\n");

}
return 0;
}

```

Optimised code

```

#include <stdio.h>

int main()
{
    int i, j, isPrime;
    printf("Prime numbers up to 100: ");
    int a=i%j;
    for (i = 2; i <= 100; i++)
    {
        isPrime = 1;
        for (j = 2; j < i; j++) {
            if (i % j == 0) {

```

```

        isPrime = 0;
        break;
    }
}
if (isPrime) {
    printf("%d ", i);
printf("\n");
}
}
return 0;
}

```

2.B Differentiate hardware and software development tools with an example for each

Hardware tools- It is meant to analyse the hardware functionality of a system

Logic analyser

Software tool- It is meant to analyse the software functionality of a system

Debugger, simulator

3. A car manufacturing industry has various tasks to be carried out . Task 1 takes 2 secs and is repeated every 4 secs , Task 2 takes 3 secs and is carried out every 8 secs . Task 3 takes 4 secs and is repeated every 24 secs .

Assume all the tasks arrive at time 0.

Schedule the tasks based on any 2 models and analyse the CPU utilization and the constraints for each model.

Tasks	Capacity	Period
Task1	2	4
Task2	3	8
Task3	4	24

LCM=24

RMS

T1	T2	T1	T2	T3	T1	T2	T1	T2	T3	T1	T2	T1	T2	T3	
0	2	4	6	7	8	10	12	14	15	16	18	20	22	23	24

Cpu UTILISATION =24/24

Constraint -1 slot of T3 not completed

EDF

T1	T2	T1		T1	T2	T1		T1	T2	T3	
0	2	5	7	8	10	13	15	16	18	21	24

CPU utilization 22/24

Constraint : 1 slot of T3 not schedulable

4. A smart city project has huge data which is collected and used for prediction and analysis. There are 3 processes which happens simultaneously. Build the 3 processes using POSIX and also incorporate scheduling .

The student has to define any process and use the following functions

Create 3 processes—6 marks

```
childid 1= fork();
if (childid == 0) { /* must be the child */
/* Process 1 */
```

```

childid 2= fork();
if (childid == 0) { /* must be the child */
/* Process 2 */
childid 3= fork();
if (childid == 0) { /* must be the child */
/* Process 3 */
Set scheduling – 2 marks

```

```

i = sched_setscheduler(,SCHED_FIFO,&sched_params);

```

```

Set scheduling priority – 2 marks
i = sched_getparam(mypid,&my_params);
my_params.sched_priority = maxval;
i = sched_setparam(mypid,&my_params);

```

5.A. "All embedded systems are not Real time systems ". Justify the same with an example for each .

Real time systems depend on real time data

Example : Audio systems and video systems play the data available . They are embedded systems as they have a dedicated function

But all RTS will be embedded systems. They may not have real time data but function is specific with a processor embedded in the system

B. Identify if the following systems are Soft RTS or Hard RTS with justification

1. A Cruise control system

It is meant to control speed automatically. So it is Hard system

2. An ATM machine

Soft-Doesn't affect

4. A Pacemaker

Hard-Life threatening if deadlines missed

5. A fitbit watch

Soft- Not based on deadlines

6. A smart fridge

Soft- Deadlines don't matter