Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

SIXTH SEMESTER BTECH. (E & C) DEGREE END SEMESTER EXAMINATION
MAY 2022
SUBJECT: EMBEDDED SYSTEM DESIGN (ECE - 4053)

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to candidates
- Answer all questions.
- Missing data may be suitably assumed.

Q1. Explain the concept of dangling pointers with an example. What is the effect of dangling pointer on program run time behavior? (3)

Q2.
```
int add (int a, int b) {    return a+b;    }

int mul (int a, int b) {    return a*b;    }

int sub (int a, int b) {    return a-b;    }

int div (int a, int b)  {    return a/b;    }
```
Write a program to do the following. Declare a function pointer which can be used to point to above functions. Assign all these functions in all possible ways to a function pointer. Call all these functions in all possible ways using function pointers.
(3)

Q3. Define a task in embedded system. Draw the state-transition diagram of a task and explain.
(4)

Q4. Explain SPI with diagram showing pin connections between master and slave device. With relevant diagram, explain how data transfer takes place through SPI interface.
(3)

Q5. Define the three main IC technologies. What are the benefits of using each of the three different IC technologies? (3)

Q6. What is a watchdog timer? Explain its working with relevant diagram. (4)

Q7. Explain round robin scheduling with an example. Explain its advantages and disadvantages. (5)

Q8. Discuss the categories of program memory with a neat diagram showing memory structure while a program is running. (3)

Q9. Suppose that two threads have several critical sections, protected by different mutexes. The following are two of those critical sections, with their protection code.

code segment 1
```
lock(m1);
…  /* code protected by m1 */
lock(m2);
…  /* code protected by m2 */
unlock(m2);
unlock(m1)
```

code segment 2
```
lock(m2);
…  /* code protected by m2 */
lock(m1);
…  /* code protected by m1 */
unlock(m1);
unlock(m2)
```

Is this a sensible way to protect this critical code? Say yes or no, and comment on your opinion. (2)

Q10. With neat diagrams, explain HCFSM model using elevator control as an example. (6)

Q11. Explain the factors on which interrupt latency depends. (4)

Q12. List and explain the three objectives which ensure profitable ROI by developing an embedded product. (4)

Q13. Explain the following operational quality attributes of an embedded system.

a) Response
b) Maintainability and availability
c) Reliability (3)

Q14. Write a C program to implement a Que data structure using the following Q definition. Use dynamic memory allocation wherever applicable. Also implement functions for the below mentioned declarations.

```
struct node {
 int data;
 struct node *next;
};
struct node* create_Q();
EnQ (int x);
int DeQ ();
void printQ (struct node* );
```
(3)