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Total Number of Pages : 02

M.Tech  
P2CTCC16

2<sup>nd</sup> Semester Regular / Back Examination 2018-19

EMBEDDED SYSTEM

BRANCH : COMPUTER SCIENCE, COMPUTER SCIENCE AND ENGG

Max Marks : 100

Time : 3 Hours

Q.CODE : F428

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.

The figures in the right hand margin indicate marks.

**Part- I**

**Q1 Only Short Answer Type Questions (Answer All-10) (2 x 10)**

- a) Embedded systems are tightly constrained systems. Justify the statement.
- b) What do you mean by the RTL specification of software processes?
- c) Write in brief about the non-recurring engineering(NRE) cost with an example.
- d) Differentiate between verification and testing.
- e) What is the function of a co-simulator in embedded system design.
- f) Mention briefly four characteristics of ARM processors.
- g) What is the value of maximum data rate in RS-232 standard?
- h) Why is scheduling of tasks is an important consideration in RTOS?
- i) What operation will be performed with the mnemonics,

EQADDS R1, R2, R3, LSL #2

- j) Mention different levels at which power reduction can be attempted.

**Part- II**

**Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)**

- a) Explain the terms dependability, safety, criticality, reliability, availability with respect to an embedded system.
- b) What is meant by an atomic operation? How is the SWAP instruction different from others from atomicity viewpoint? How does it help in implementing "semaphores", explain with suitable example.
- c) State the differences between the ways in which software interrupts are handled in Intel processors and in ARM.
- d) Explain automated arbitration and collision detection in CAN with an example.
- e) What are the different types of data transfers possible in USB? Explain them.
- f) What are the advantages of event-driven scheduling over clock-driven ones? Mention different types of event-driven schedulers.
- g) Suppose there are 100 tasks T1 through T100, with the priority of the ith task being i. Determine how the tasks will get distributed into 10 priority levels using uniform, arithmetic, geometric and logarithmic assignment schemes.
- h) What is meant by history mechanism in StateChart? How do you think can it be implemented in software?
- i) State the difference between a homogeneous and a heterogeneous co-simulation strategy.

- j) Discuss the strategy for automated interface synthesis.
- k) With the help of suitable examples describe following C programming elements
  - i) Header file
  - ii) Modifier
- l) The following routines are called by Tasks A, B, and C, but they don't work. How would you fix the problems?

```
Static intiRecordCount;

Void increment_records(intiCount)
{
    OSSemGet(SEMAPHORE_PLUS);
    iRecordCount += iCount;
}

Void decrement_records(intiCount)
{
    iRecordCount -= iCount;
    OSSemGive(SEMAPHORE_MINUS);
}
```

### Part-III

#### Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Write the following programs in the assembly language of ARM. **(16)**
  - a) Sort a given set of numbers.
  - b) Find second highest of a set of numbers without actually sorting it.
  - c) Concatenate two null-terminated strings.
- Q4** Write detailed notes on ISR and UART. **(16)**
- Q5** Write a explanatory note on Unified Modelling Language(UML). **(16)**
- Q6**
  - a) A particular motor operates at 10 revolutions per second when its controlling input voltage is 3.7 V. Assume that you are using a microcontroller with a PWM whose output port can be set high (5 V) or low (0 V).
    - i) Compute the duty cycle necessary to obtain 10 revolutions per second.
    - ii) Provide values for a pulse width and period that achieve this duty cycle.
  - b) Given an analog output signal whose voltage should range from 0 to 10 V, and a 8-bit digital encoding, provide the encodings for the following desired voltages:
    - i) 0V,            ii) 1 V,            iii) 5.33 V,            iv) 10 V.
    - v) What is the resolution of our conversion?**(16)**