Register Number: ………………..

B.E DEGREE EXAMINATIONS: MAY 2015

(Regulation 2009)

Sixth Semester

MECHATRONICS ENGINEERING

MCT140: Embedded System Design

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1.   An embedded system must have

   a)   Hard disk   b)   Processor and memory

   c)   Speaker   d)   Operating system

2.   If two parts drive the same signal at the same time in different way is called _____ which usually leads to destroy one (or both) of the parts.

   a)   Floating   b)   Open collector devices

   c)   Bus fight   d)   Driving the signal

3.   A major benefit of the Harvard Architecture is

   a)   Single-word instructions execute more quickly than multi-word instructions   b)   Code and data share memory and increase hardware efficiency

   c)   Interrupt latency time is very predictable because instructions execute in a single cycle   d)   Code and data can be loaded into the CPU simultaneously on separate buses

4.   PCL is

   a)   Lower 8 bits of program counter   b)   Upper 5 bits of program counter

   c)   Upper 5 bits of PCLATH   d)   Upper 8 bits of 13 bit program counter.

5.   A _____ stops low priority task as soon as high priority task unblocks.

   a)   Scheduler   b)   Non preemptive RTOS

   c)   Preemptive RTOS   d)   Compiler

6.   Which of the following is not a mechanism for achieving Mutex?

   a)   Disabling the scheduler   b)   Semaphores

   c)   Disabling the tasks   d)   Disabling the interrupts

7. A Real Time Kernel is
   a) A node
   b) Relocatable object code
   c) Software portion which provides task scheduling and dispatching
   d) Software portion which initiate an event

8. (i) Model/analyze requirements and specifications of system (ii) Design data structure, software architecture, interfaces and algorithms (iii) Test the design (iv) Implementation of design (v) component level design (vi) Test all internal logic and external functions of the system and (vii) system integration

   Activities during software design cycle are in sequence of
   a) i to vii
   b) i, ii, v, iv, vii and vi
   c) i, ii, v, iv, vi and vii
   d) i, ii, v, iii, iv, vi and vii.

9. A cross-compiler is used to
   a) Convert high-level language code to assembler code
   b) Compile code for a target CPU that is different from the development CPU
   c) Convert one high-level language to a different high-level language
   d) Combine both high-level language and assembler into a single module

10. What is the difference between a simulator and an emulator in embedded system development?
    a) A simulator runs in the target system while an emulator runs in the development system
    b) A emulator runs in the target system while an simulator runs in the development system
    c) A simulator is intended for assembly language testing while an emulator is intended for C-code testing
    d) There is no practical difference. Different companies name these similar tools with different names

PART B (10 x 2 = 20 Marks)

11. Define Embedded System.

12. In what kind of memory would you store each of the following? Justify.

    i) The program for an intelligent VCR of which your company hopes to tell 10 million units.

    ii) The data that your program just received from the network.

13. What are the addressing modes used in PIC Microcontroller?

14. What are modes of operation of timers in PIC micro controller?

15. Is the following function reentrant? Why?

```
int cErrors;

void vCountErrors ( int cNewErrors)

{

cErrors += cNewErrors;

}
```

16. Compare Function queue scheduling architecture with RTOS.

17. How does the scheduler know when a task has become blocked or unblocked?

18. How RTOS differs from desktop OS?

19. List the advantages of Logic Analyzers over Emulators.

20. Mention the use of Software only Monitors.

PART C (5 x 14 = 70 Marks)

21. a) (i) State the challenges in embedded system design. (4)

      (ii) Discuss in detail about Interrupt Latency. (10)

(OR)

   b) Explain about shared data problem with an example and discuss about the techniques to avoid it.

22. a) With a neat diagram discuss in detail about the architecture of PIC micro controller.

(OR)

   b) Explain in detail about I^2C bus operation.

23. a) (i) Consider a system that controls the traffic lights at a major intersection. It reads (10) from sensors that notice the presence of cars and pedestrians, it has a timer, and it turns the lights red and green appropriately. What architecture might you use for such a system? Why? What other information, if any, might influence your decision?

      (ii) Compare the characteristics of various software architectures used for Embedded (4) System Design.

(OR)

b)   Discuss about the architecture of Round Robin with Interrupts with an example and mention its advantages over Round Robin architecture.

24.   a)   Summarize the role of Semaphore in real time embedded programming and discuss about the .

(OR)

b)   Discuss about how the inter process communication is carried out in RTOS.

25.   a)   Write short notes on any two techniques used for getting the embedded software into the target system.

(OR)

b)   Give the function of linker / locator and explain the process of building application software with native tools.

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