

Name of the Course : B.Sc.(H) Electronics (DSE)
Name of the Paper : Advanced Embedded System Design with ARM
Semester : VII
Duration : 3 hours
Maximum Marks : 90

Instruction for Candidates

There are seven questions in all, out of which you have to attempt any five questions

All questions carry equal marks

Sub-parts can be given

First Question is Compulsory.

1.
 - a. How many general purpose registers are there in ARM Cortex M3? What is the role of link register?
 - b. What is the pipeline structure of the Cortex-M3?
 - c. What is the function of the control register?
 - d. Why is the Thumb instruction set used in ARM microcontrollers? How is Thumb 2 different from the Thumb instruction set?
 - e. Differentiate between preemptive and non preemptive interrupt?
 - f. What is the role of an operating system in a microcontroller?

6X3 =18
- a. Explain how exceptions and interrupts are handled by ARM cortex M3 using different modes of operations and privilege levels. (6)
 - b. What do you understand by Reset sequence and debugging support in ARM cortex M3. (6)
 - c. Discuss the features and applications of the ARM microcontroller. (6)
3.
 - a. Write an assembly program to copy an array from one memory location to another. (6)
 - b. What is CMSIS-Core? Explain the use of standardized register definitions in CMSIS and how CMSIS improves code portability. (8)
 - c. What are byte-reversal instructions? Give examples (4)
4.
 - a. What are the effects of GPIO speed on signal integrity and when should you use slower output speeds? (6)
 - b. How are GPIO pins configured to be an input or an output in a Cortex-M3 microcontroller? (6)
 - c. Describe the different modes of operation for an ARM timer. (6)
5.
 - a. Explain rate monotonic scheduling (RMS) with an example. (8)
 - b. Explain semaphores and mutexes with suitable examples. (6)
 - c. What is priority inversion? How can it be prevented? (4)

6.
 - a. Give in detail the functionality of the Nested Vectored Interrupt Controller (NVIC) and its role in deterministic interrupt handling? (9)
 - b. How can you configure a timer to generate a specific waveform, such as a square wave or pulse-width modulation (PWM) signal? (9)
7.
 - a. Explain system calls in RTOS with an example. (6)
 - b. Compare bare-metal programming and RTOS-based programming. (6)
 - c. What are Fault exceptions (HardFault, MemFault, etc.)? Explain. (6)