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CBCS SCHEME

USN | | | | | | | | | | |

18CS44

Fourth Semester B.E. Degree Examination, July/August 2022
Microcontroller and Embedded Systems

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Compare Microprocessors and Microcontrollers. **(06 Marks)**
b. Discuss the ARM design Philosophy. **(06 Marks)**
c. With a neat diagram, explain the four main hardware components of an ARM based embedded device. **(08 Marks)**

OR

2 a. Explain the ARM Core data flow model with a neat diagram. **(08 Marks)**
b. Draw the basic layout of a generic program status register and briefly explain the various fields. **(06 Marks)**
c. What is Pipelining? Illustrate it with a simple example. **(06 Marks)**

Module-2

3 a. Explain the different Data Processing Instructions in ARM. **(10 Marks)**
b. Briefly explain the different Load – Store Instruction categories used with ARM. **(10 Marks)**

OR

4 a. Write a program for forward and backward branch by considering an example. **(06 Marks)**
b. Explain Co – Processor Instructions of ARM processor. **(06 Marks)**
c. Write a note on Profiling and Cycle Counting. **(08 Marks)**

Module-3

5 a. What is an Embedded System? Differentiate between general purpose computing system and embedded system. **(06 Marks)**
b. List any four purposes of Embedded system with examples. **(08 Marks)**
c. Write short notes on : i) Real Time Clock ii) Watch Dog Timer. **(06 Marks)**

OR

6 a. Briefly describe the classification of Embedded system. **(08 Marks)**
b. Explain the following :
i) I 2 C Bus ii) S P I Bus iii) Reset Circuit iv) 1 – Wire Interface. **(12 Marks)**

Module-4

7 a. What are the Operational and Non – Operational Quality Attributes of an Embedded system? **(10 Marks)**
b. Explain the different communication buses used in Automotive applications. **(06 Marks)**
c. Design an FSM model for Tea / Coffee vending machine. **(04 Marks)**

OR

8 a. Explain the Fundamental issues in Hardware Software Co - design. (06 Marks)
b. Explain the Assembly language based Embedded firmware development with a diagram. (06 Marks)
c. With a neat block diagram, how source file to object file translation takes place in High level language based firmware development. (08 Marks)

Module-5

9 a. With a neat diagram, explain Operating System Architecture. (08 Marks)
b. Explain Multithreading. (06 Marks)
c. Explain the concept of Binary Semaphore. (06 Marks)

OR

10 a. Explain the role of Integrated Development Environment (IDE) for Embedded Software development. (08 Marks)
b. Write a note on Message passing. (08 Marks)
c. Explain the concept of deadlock with a neat diagram. (04 Marks)

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18CS44

Fourth Semester B.E. Degree Examination, Feb./Mar. 2022
Microcontroller and Embedded Systems

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Explain ARM core dataflow model and mention the different registers of ARM processor. **(07 Marks)**

b. Differentiate between CISC and RISC, and explain the four major rules of RISC design. **(08 Marks)**

c. With the help of basic layout diagram, explain the current program status register. **(05 Marks)**

OR

2 a. With a neat block diagram, explain typical ARM based Embedded System. **(07 Marks)**

b. Explain the different operating modes of ARM processor. **(07 Marks)**

c. What is pipeline in ARM? Explain the different pipeline stages of ARM9 processor. **(06 Marks)**

Module-2

3 a. With example, explain the following ARM instructions.
i) MOV ii) MVN iii) ADC iv) RSC v) BIC. **(10 Marks)**

b. Explain the different branch instructions of ARM processor. **(05 Marks)**

c. Explain the multiply instructions of ARM processor. **(05 Marks)**

OR

4 a. Explain the different barrel shifter operations with suitable examples. **(06 Marks)**

b. Write a note on Instruction scheduling. **(06 Marks)**

c. Write a C program that prints the squares of the integers between 0 to 9 using function and explain how to convert this C function to an assembly function. **(08 Marks)**

Module-3

5 a. Explain the various purposes of embedded systems in detail. **(07 Marks)**

b. Explain the role of different types of memories used in embedded system. **(07 Marks)**

c. Explain Little Endian and Big Endian architecture. **(06 Marks)**

OR

6 a. With a neat interface diagram, illustrate the connection of master and slave devices on I^2C bus. **(07 Marks)**

b. With a neat diagram, explain the interfacing of stepper motor through the driver circuit to microcontroller. **(07 Marks)**

c. Explain the classification of embedded systems based on generation and based on complexity and performance requirement. **(06 Marks)**

Module-4

7 a. List all the operational and non-operational quality attributes of an embedded system and explain any one operational quality attribute. **(07 Marks)**

b. Explain the different communication buses used in automotive application. **(07 Marks)**

c. Compare C with embedded C and complier with cross complier. **(06 Marks)**

OR

8 a. Design and explain FSM model for Tea/Coffee vending machine. **(08 Marks)**

b. Explain how assembly language source file is translated to machine language object file. **(06 Marks)**

c. Explain the fundamental issues in Hardware – Software Co – design. **(06 Marks)**

Module-5

9 a. Define Task, Process and Treads. Explain the process structure, process states and state transitions. **(08 Marks)**

b. With a neat diagram, explain operating system architecture. **(07 Marks)**

c. Differentiate between Multiprocessing and Multitasking. **(05 Marks)**

OR

10 a. Explain the role of Integrated Development Environment (IDE) for embedded software development. **(06 Marks)**

b. Explain the functional and non-functional requirements for selecting RTOS for an embedded system. **(06 Marks)**

c. Write a note on :
i) Boundary scan
ii) Simulators. **(08 Marks)**

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18CS44

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Microcontroller and Embedded Systems

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Differentiate between RISC and CISC processors. **(06 Marks)**
b. Explain ARM core data flow model, with neat diagram. **(08 Marks)**
c. Explain ARM registers used under various modes. **(06 Marks)**

OR

2 a. Explain the architecture of a typical embedded device based in ARM core, with a neat diagram. **(08 Marks)**
b. Explain the various fields in the current program status register. **(06 Marks)**
c. Discuss the following with diagram :
i) Von Neuman architecture with cache.
ii) Harvard architecture with TCM. **(06 Marks)**

Module-2

3 a. Explain the Barrel Shifter Operation in ARM processor, with neat diagram. **(06 Marks)**
b. Discuss the load store instruction with respect to :
i) Single Register Transfer ii) Multiple Register Transfer. **(08 Marks)**
c. Write the short notes on :
i) Register Allocation ii) Allocation variables to register numbers. **(06 Marks)**

OR

4 a. Write an ALP using ARM instruction to find the factorial of a given number. **(06 Marks)**
b. Explain Instruction scheduling with respect to ARM Processor. **(10 Marks)**
c. Show the post condition when MOVs instruction shifts register r1 left by one bit and result is stored in r0. Where r0 = 0 × 00000000 , r1 = 0 × 80000004 and CPSR = nzcvqiFt. **(04 Marks)**

Module-3

5 a. Differentiate between :
i) Microprocessor and Microcontroller.
ii) Little Endian and Big Endian architecture. **(08 Marks)**
b. With neat block diagram, explain the elements of embedded system. **(06 Marks)**
c. Mention the application of embedded system with example of each. **(06 Marks)**

OR

6 a. Explain the different On board communication interfaces in brief. **(08 Marks)**
b. Write a note on :
i) Reset circuit ii) Watch dog timer. **(06 Marks)**
c. Explain how program memory are classified. **(06 Marks)**

Module-4

7 a. Explain the Operational and non operational attributes of an embedded systems. **(10 Marks)**

b. Explain the different 'Embedded firmware design' approach in detail. **(10 Marks)**

OR

8 a. With a neat block diagram, explain design and working of Washing Machine. **(10 Marks)**

b. With FSM model, explain the design and operation of automatic tea/coffee vending machine. **(06 Marks)**

c. Explain Super loop based approach of embedded firmware design. **(04 Marks)**

Module-5

9 a. Explain the concept of 'deadlock' with a neat diagram. Mention the different conditions which favour a dead lock situation. **(10 Marks)**

b. Write a note on Message passing. **(10 Marks)**

OR

10 a. Explain Multiprocessing , Multitasking and Multi programming. **(10 Marks)**

b. Define Process. Explain in detail the structure , Memory organization and State transitions of the process. **(10 Marks)**

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