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Question Paper Code : 30562

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2024

Sixth/Seventh/Eighth Semester

Electrical and Electronics Engineering

EE 8018 – MICROCONTROLLER BASED SYSTEM DESIGN

(Regulations 2017)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. How does the presence of conditional branches affect pipelining in PIC microcontrollers?

2. How does the Harvard architecture benefit PIC microcontroller?

3. Provide an example of a project or application where state machines and key switches are utilized in PIC microcontroller programming.

4. How can soft keys be displayed and controlled on a graphical user interface (GUI) in PIC microcontroller projects?

5. What is the primary function of a serial EEPROM in electronic devices?

6. What are the key considerations when selecting a sensor for interfacing with a PIC microcontroller?

7. What is the significance of the 'ldr' instruction in ARM assembly language?

8. Name any two popular IDEs used for ARM development.

9. What features of the ARM architecture make it well-suited for high-level language (HLL) programming?

10. How does a coprocessor differ from the main ARM processor?

PART B — (5 × 13 = 65 marks)

11. (a) (i) Differentiate between program memory and data memory in PIC microcontrollers. (3)

    (ii) Describe the process of programming code into program memory in PIC microcontrollers. Also, discuss how the program memory architecture impact the execution speed and efficiency of PIC microcontrollers? (10)

Or

(b) List the categories under which the instructions in the instruction set of the PIC microcontrollers are grouped. Explain the operation of any two instructions in each groups.

12. (a) Explain the concept of nested interrupts and their implications for interrupt handling in PIC microcontrollers. Also, provide an example of an application where interrupts are utilized effectively in PIC microcontroller programming.

Or

(b) Discuss the various timer modes available in PIC microcontrollers. Also, discuss how timers can be synchronized and coordinated with other peripherals or external events in PIC microcontroller applications.

13. (a) Outline the primary steps involved in configuring the I²C module on a PIC microcontroller for communication. Also, describe the process of writing data to a slave device on the I²C bus using a PIC microcontroller.

Or

(b) Describe the process of configuring the ADC module on a PIC microcontroller for analog signal conversion. How does the resolution of the ADC module affect its performance in converting analog signals to digital values?

14. (a) With a functional block diagram, illustrate the main components and their interconnections within the ARM processor architecture, highlighting the key elements responsible for its operation and functionality.

Or

(b) Explain the organization of memory in ARM-based systems. How memory addresses are allocated and accessed and what are the typical memory regions used for code, data, stack and peripherals?

15. (a) Describe the five stages of the pipeline organization in ARM processors. What are the tasks performed in each stage and how do they contribute to instruction execution?

Or

(b) Elucidate the operation of any three instructions within each of the following categories of the ARM instruction set:

   (i)   Data processing operations,   (4)

   (ii) Data transfer operations,   (3)

   (iii) Control flow operations and   (3)

   (iv) Logical operations.   (3)

PART C — (1 × 15 = 15 marks)

16. (a) Imagine you are tasked with designing a portable device equipped with both a Liquid Crystal Display (LCD) and a keyboard for user interaction. The device is powered by a PIC microcontroller and needs to display information on the LCD screen while also allowing users to input data using the keyboard. Discuss the necessary functions to initialize and communicate with the LCD screen using the PIC microcontroller. Develop functions to identify key presses, eliminate key bounce and interpret the keys that have been pressed.

Or

(b) A company specializing in smart home automation systems in developing a new product line that integrates ARM microcontrollers to control various home devices remotely. Discuss the key functionalities enabled by ARM microcontrollers, including sensor integration, data processing, power management, wireless connectivity and user interaction. Additionally, analyze the advantages of using ARM microcontrollers for this application compared to other microcontroller architectures.