Reg. No. :

Question Paper Code : 20502

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2022.

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. Highlight the significance of working register in PIC microcontroller.

2. Add the given two eight-bit binary numbers b1 = 0011 1000 and b2 = 0011 1000 and report its influence on the digit carry bit.

3. Outline about INTEDG bit of OPTION_REG.

4. What are the external interrupts of PIC microcontroller?

5. What is I²C bus?

6. Assume the transmitter transmits data at exactly 9600Bd and assume the receiver measures its sampling times from the exact moment when the STOP-TO-START transition occurs. How far off from 9600Bd can the receiver's Baud rate clock be and still recover the data and the STOP bit correctly?

7. List the drawbacks of RISC architecture.

8. What is auto-indexing?

9. Calculate the program execution time of the ARM processor having a clock frequency of 52μs with 20 number of instructions and average number of clock cycles per instruction is 10.

10. What is the importance of barrel shifter in ARM processor?

PART B — (5 × 13 = 65 marks)

11. (a) (i) With relevant illustrations, explain the architecture of PIC16C74A microcontroller in detail. (8)

    (ii) Write a code to decrement a 16-bit variable and test the result for zero, branching to HALT if the result is zero. (5)

Or

    (b) (i) With illustrations and examples, explain the role of program counter in Accessing Program Memory. (7)

    (ii) Assume that a 16-bit accumulator made up of RAM bytes namely ACC16H, ACC16L. Write the instructions to a add a 16-bit number NUM16H, NUM16L to the contents of the accumulator, leaving the result in the accumulator and setting the C and Z bits appropriately. Minimize program words. (6)

12. (a) (i) Write an assembly language program to scan the keyswitches present in a keypad and determine whether any keyswitch is pressed. (8)

    (ii) Determine the proper initialization of T2CON and PR2 to setup Timer2 as: (5)

       (1) A Scale of $7 \times 150 \times 4 = 4200$

       (2) A scale of 35200 counter

Or

    (b) With illustrations, explain the operation of Timer1 in compare and capture mode. Assume relevant data.

13. (a) With an interfacing diagram, write an assembly language program to generate square wave using DAC with PIC microcontroller.

Or

    (b) Explain the UART's data handling circuitry with its associated registers in detail. Draw the interfacing diagram with PIC microcontroller.

14. (a) (i) Explain the memory hierarchy supported by ARM. (7)

    (ii) Write a program to store r_0 =12345678 and r_1=9ABCDEFO in ARM processor. (6)

Or

    (b) (i) Explain the ARM programmer model with relevant diagrams.

    (ii) Write an assembly language subroutine program in ARM to output a text string, immediately following the 'CALL'.

15. (a) With relevant diagrams, explain the following:

    (i) 3-stage pipeline ARM organization (7)

    (ii) ARM multi-cycle instruction 3-stage pipeline operation (6)

Or

    (b) Explain the 5-stage pipeline organization in detail with relevant diagrams.

PART C — (1 × 15 = 15 marks)

16. (a) Design an ARM based embedded system to work as Bluetooth Baseband Controller.

Or

    (b) Design a smart mobile phone using ARM based embedded system.