Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2015

SUBJECT: ADVANCED ENERGY MANAGEMENT [ELE 457]

REVISED CREDIT SYSTEM

Time: 3 Hours   28 NOVEMBER 2015   MAX. MARKS: 50

Instructions to Candidates:

❖ Answer **ANY FIVE FULL** questions.
❖ Missing data may be suitably assumed.
❖ Support all your programs with relevant comments.

1A. What do you mean by load/ store architecture with respect to RISC processor architecture? Does ARM7 processor fully support load/store architecture? Discuss. Give any one instruction example (each) for load and store operations in case of ARM7. **(03)**

1B. Describe all the four instructions of ARM7 (compare and test instructions) which do not require 'S' extention to modify flags. Illustrate all the four instructions with an example. **(03)**

1C. Describe the importance of energy conservation and explain the various initiatives taken by the government in this direction. **(04)**

2A. Write a subroutine in assembly language for ARM7 processor to divide one '32' bit number by another '32' bit number. Assume that the dividend and divisor are passed to subroutine through R2 and R3 registers. Return quotient through R4 register and remainder through R5 register. If there is an attempt to divide by zero, return 0XFFFFFFFF through R1 register as an error code; otherwise return '0' in R1 register. **(03)**

2B. Mention the various uses of stack memory in case of ARM7 processor based system. List the various types of stack memory implementations possible in case of ARM7, along with the instructions used for PUSH and POP operations. Explain any one of them in detail. **(04)**

2C. Write single ARM7 instruction to perform the following operations

    i.   Multiply the value of R10 register by 63.

    ii.   With R1 register containing 0X0000A080, load R5 register with 32 bit data from 0X0000A090 – 0X0000A093, R4 register from 0X0000A08C – 0XA08F, R3 register from 0XA088 – 0XA08B and R2 register from 0XA084 – 0XA087. At the end of the instruction execution, R1 should contain 0X0000A090.

    iii. Subtract the value of R5 register from R6 register along with carry only if the negative flag is set, store the result in R4 register and modify flags. **(03)**

3A. Explain the undefined instruction exception of ARM7 processor. **(02)**

3B. Show the interfacing circuit to interface a common cathode '7' segment display device to ARM cortex M3 based NXPLPC1768 microcontroller using pins P10 to P18 and write a 'C' code to display numbers '0' to '9' continuously with a delay of 4.3 seconds. Use pin P22 as an interrupt pin and when interrupted through falling edge, write an ISR to obtain '8' cycles of 100Hz, 30% duty cycle wave form at P23 pin and then return back to main program. **(04)**

3C. With the help of a relevant connection/ block diagram explain the working of an ARM processor based '3' phase digital/ smart energy meter. Include the expressions used to calculate various parameters. **(04)**

4A Compare procedure oriented and object oriented programming concepts. **(03)**

4B Explain the basis on which performance of an algorithm is assessed. **(03)**

4C Write a pseudocode algorithm to count the number of digits in a binary representation of a decimal number. Analyse the performance of this algorithm. **(04)**

5A List some real time applications of data structures. **(03)**

5B Create a balanced binary search tree using A =[10, 20, 30, 40, 50]. Data has to be inserted in the same sequence as in array 'A'. **(03)**

5C Illustrate with suitable example, given a stack, how to reverse the elements of stack using only PUSH and POP operations. Make suitable assumptions. **(04)**

6A Explain the purpose of using Database systems. **(03)**

6B Differentiate between Data Definition Language (DDL) and Data Manipulation Language (DML). **(03)**

6C Create an Entity relationship (ER) model to record the power consumption details of residential users. **(04)**