B. E. IN ELECTRICAL ENGINEERING (EVENING) EXAMINATION, 2018

3rd Year, 2nd Semester

SUBJECT: - PROGRAMMABLE LOGIC AND MICROCONTROLLER

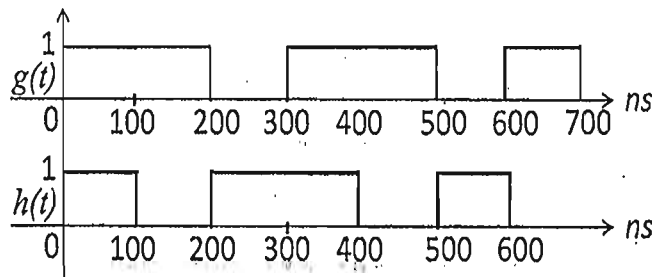Time: Three hours   Full Marks: 100

Answer any five questions.   20×5

1. a. Explain with proper circuit diagram, how a single macrocell can be used to   8
       implement various outputs.
    b. Discuss the different steps involved in simulation and synthesis in a typical   7
       CAD system.
    c. What is a JTAG cable? What is its role in context with device programming?   5

2. a. Draw and explain a circuit diagram to implement the logic function $f = ab + \bar{c}$ 10
       using transistor pair logic in FPGA.
    b. Discuss the antifuse switching technology employed in FPGA with proper   5
       example. Discuss the applications of FPGA.
    c. What are the advantages of FPGAs over CPLDs?   5

3. a. Describe in brief the working principle of FAMOS device as programmable   10
       switch.
    b. Describe with neat circuit diagram, the functionality of a commercially   10
       available CPLD chip.

4. a. Write a program in VHDL to implement an XNOR gate.   10
    b. A timing diagram shown in figure is generated by a test bench to apply at two   10
       inputs g and h of an entity boolfn. Write the testbench in vhdl containing
       tbboolfn as entity and boolfnarch as architecture.

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5. a. Compare the following 8051 instructions in terms of the number of bytes per 6
instruction, machine cycle per instruction and effective jump address range.
     (i)   SJMP;
     (ii)   AJMP;
     (iii)   LJMP.

  b. Differentiate between the following instructions of 8051 microcontroller. 4
     (i)   SWAP & XCHG;
     (ii)   MOVX & MOVC;
     (iii)   Bit level ANL & Byte level ANL;
     (iv)   CALL & ACALL.

  c. Show the result of execution of following groups of instructions, if correct. If 10
these are not correct, identify the erroneous code with justification.
    (I) MOV P0, #FFh
       ANL P0, A

    (ii) MOV A, #7Bh
       MOV B, #0FDh
       MUL AB

    (iii) ORG 0C941h
       MOV A, #30h
       AJMP 9D73h

    (iv) MOV B, #00h
       MOV A, B
       DIV AB

    (v) MOV A, #8Ah
       MOV R0, #34h
       ADD A, R0
       DAA

6. a. Mention the name of logical instructions available in 8051. Write example for 10
each type along with the name of flags that are affected after execution of
these instructions.

  b. Copy a block of 12-bytes of data from RAM location 30H onwards to 60H 10
onwards. When a byte is equal to 0EH, stop copying. Write an appropriate
program in assembly language of 8051. Explain your solution.

Ref No: EX/EE/5/T/321/2018

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7. a. Write a program on 11.0592 MHz, 8051 microcontroller to generate a square   10
wave of 100 Hz frequency. The waveform will be available at pin-0 of port-1.
Use timer-1 of the microcontroller. Justify your program with proper
comments and explanation.

   b. An 8051 microcontroller is interfaced with a pair of switches SW0 and SW1 as   10
well as a seven segment display which is connected to the controller through
8-pins of port-3 (P3). The display unit is enabled by an active-low signal
coming from P1.2 pin. The switches on the other hand are connected to P1.0
and P1.1 pins of controller as shown in the figure.

seven segment
display
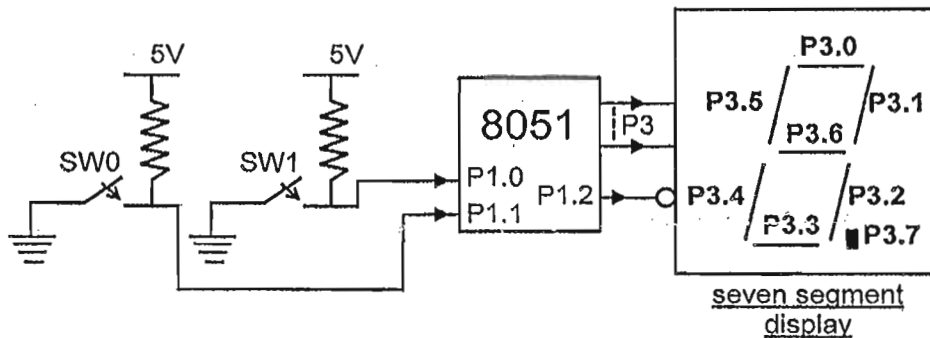
Write an appropriate program to sense the switches. If SW0 is closed a '0' will be
displayed. If SW1 is closed a '1' will be displayed. If both the switches are closed
an '8' will be displayed. For no key press, nothing will be displayed.

8. a. A seven segment display unit containing eight low-current LEDs in common   12
cathode configuration, is connected to port-3 of 8051 microcontroller. Write a
program to increment the display from 0 through 9 cyclically. Draw the
hardware diagram, required connections, port map and explain your solution.

   b. Illustrate the role of program counter and stack pointer in branching   8
instructions.