

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

3rd Year, 2nd Semester

**SUBJECT: - PROGRAMMABLE LOGIC AND MICROCONTROLLER**

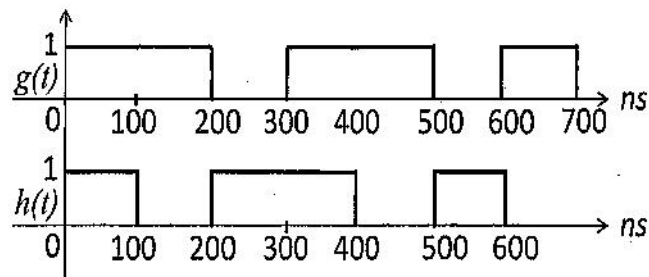
Time: Three hours

Full Marks: 100

**Answer any five questions.**

20×5

1. a. Explain with proper circuit diagram, how a single macrocell can be used to implement various outputs. 8  
 b. Discuss the different steps involved in simulation and synthesis in a typical CAD system. 7  
 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  $f = ab + \bar{c}$  using transistor pair logic in FPGA. 10  
 b. Discuss the antifuse switching technology employed in FPGA with proper example. Discuss the applications of FPGA. 5  
 c. What are the advantages of FPGAs over CPLDs? 5
3. a. Describe in brief the working principle of FAMOS device as programmable switch. 10  
 b. Describe with neat circuit diagram, the functionality of a commercially available CPLD chip. 10
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 inputs g and h of an entity boolfn. Write the testbench in vhdl containing tbboolfn as entity and boolfnarch as architecture. 10



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5. a. Compare the following 8051 instructions in terms of the number of bytes per instruction, machine cycle per instruction and effective jump address range. 6
- (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 these are not correct, identify the erroneous code with justification. 10
- (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 each type along with the name of flags that are affected after execution of these instructions. 10
- b. Copy a block of 12-bytes of data from RAM location 30H onwards to 60H onwards. When a byte is equal to 0EH, stop copying. Write an appropriate program in assembly language of 8051. Explain your solution. 10

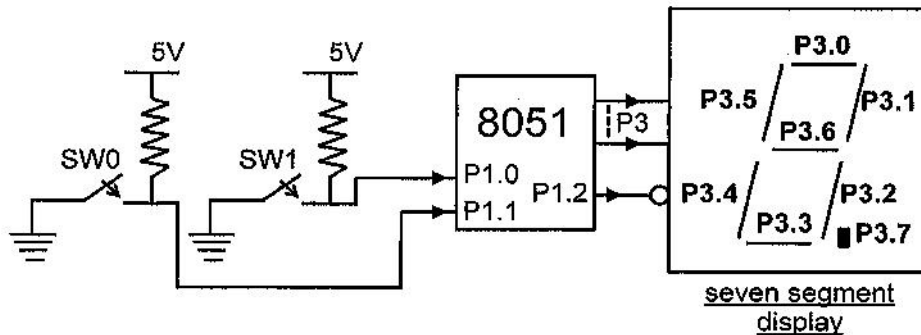
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7. a. Write a program on 11.0592 MHz, 8051 microcontroller to generate a square wave of 100 Hz frequency. The waveform will be available at pin-0 of port-1. Use timer-1 of the microcontroller. Justify your program with proper comments and explanation. 10
- b. An 8051 microcontroller is interfaced with a pair of switches SW0 and SW1 as 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. 10



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 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. 12
- b. Illustrate the role of program counter and stack pointer in branching instructions. 8