

**B. E. (ELECTRICAL ENGINEERING) 3<sup>RD</sup> YR 2<sup>ND</sup> SEMESTER EXAMINATION, 2023**

**SUBJECT: - PROGRAMMABLE LOGIC & MICROCONTROLLER**

Time: Three hours

Full Marks 100  
(50 marks for each part)

Use a separate Answer-Script for each part

**PART I**

*Answer any FIVE Questions.*

1. Describe the basic structure and working principle of a programmable logic device with the help of necessary circuit diagram. 10
2. Why are diodes or transistors not used for MOS devices? Describe any one switching technology adopted in FPGA to implement configurable hardware. 2+8
3. With the help of a block diagram discuss the functions of different components of a PAL device. 10
4. a) State the reasons for different speed performance of ICs.  
b) Draw and describe the structure of a macrocell used in Altera MAX 7000. 3+7
5. Explain the process used in CAD system for configuring SPLD. 10
6. With a simple example describe the transistor pair logic used in FPGA. 10
7. Write a program in VHDL to implement an XNOR gate. 10
8. Write short notes on (any two): 5 x 2
  - a) AND plane of a PAL device
  - b) JTAG cable
  - c) Antifuse
  - d) Different Logic States in VHDL

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**BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) THIRD YEAR SECOND**  
**SEMESTER EXAMINATION, 2023**

**SUBJECT: - PROGRAMMABLE LOGIC AND MICROCONTROLLER**

Time: Three hours

Full Marks 100  
(50 marks for each part)

Use a separate Answer-Script for each part

No. of Questions	PART II	Marks
	<p align="center">Answer any <b>Three</b>. <i>Two marks reserved for neatness.</i></p>	
1.	<p>Compare (any <b>four</b>):</p> <p>a) Microprocessor and Microcontroller</p> <p>b) ROM and RAM</p> <p>c) RISC and CISC processors</p> <p>d) Princeton and Harvard architecture</p> <p>e) Timer and counter</p> <p>f) Low current and high current LEDs</p>	4x4=16
2.	<p>a) An LED is connected to bit-3 of PORTC. Without disturbing rest of the bits, write a program to blink the LED with a frequency and duty cycle of 2Hz and 80%, respectively.</p> <p>b) A receiver is connected to bit-5 of PORTA. It is required to send the ASCII character 'U' to the receiver serially. LSB of the character should reach the receiver first. Write an appropriate program.</p>	8 8
3.	<p>What do you mean by (any <b>four</b>)</p> <p>a) Bootloader</p> <p>b) Compiler</p> <p>c) In-System Programming (ISP)</p> <p>d) Special purpose processor</p> <p>e) Packaging of IC</p>	4x4=16

4.	<p>a) Write a segment of program to</p> <p>i) Create a never-ending, i.e., infinite loop in a program.</p> <p>ii) Check bit-5 of PORTB only, as a result of which bit-6 of PORTL will be set or reset accordingly.</p> <p>iii) Connect a switch with a pull-up or pull-down resistor such that opening and closing the switch will generate logic-1 and logic-0, respectively.</p> <p>iv) Swap the upper 4-bits and lower 4-bits of a variable.</p> <p>b) Write a program to read an 8-bit data through 1-pin of a port of microcontroller. Explain your solution.</p>	4x2=8           8															
5.	<p>a) Read pin-6 and pin-7 of PORTB. Then send ASCII data to PORTA according to the truth table, shown below:</p> <table border="1"> <thead> <tr> <th>Pin-6</th> <th>Pin-7</th> <th>ASCII DATA</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>Z</td> </tr> <tr> <td>0</td> <td>1</td> <td>L</td> </tr> <tr> <td>1</td> <td>0</td> <td>M</td> </tr> <tr> <td>1</td> <td>1</td> <td>H</td> </tr> </tbody> </table> <p>b) Using in-built timer of the microcontroller IC, write a program to generate a time delay of 1 second. The on-board oscillator operates at 16MHz. Write an appropriate program and explain your solution.</p>	Pin-6	Pin-7	ASCII DATA	0	0	Z	0	1	L	1	0	M	1	1	H	8           8
Pin-6	Pin-7	ASCII DATA															
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1	0	M															
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