Hall Ticket Number:

Code No. : 16403

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD
B.E. (ECE: CBCS) VI-Semester Main Examinations, May-2019
Microcontrollers and Applications

Time: **3 hours**   Max. Marks: **70**

*Note: i. Answer **ALL** questions in **Part-A** and any **FIVE** from **Part-B***
ii. Assume that the microcontroller used is Intel's 8051 with a crystal frequency (XTAL), f_{osc}
*as **11.0592MHz** operating with 5-Volts DC, unless otherwise explicitly specified.*
iii) One machine cycle is 12-oscillator periods.

Q. No.	Stem of the question	M	L	CO	PO
	Part-A (10 × 2 = 20 Marks)				
1.	For 8051, match the following instruction with the correct addressing mode: a. `MOV DPTR, #0400H` (i) Direct b. `MOV R0, 30H` (ii) Indexed c. `ADD A, @R0` (iii) Immediate d. `MOVC A, @A+DPTR` (iv) Register Indirect	2	1	1	1
2.	Write an assembly language program to fetch **10-Bytes** of data from **300H** of **ROM**, and, copy its 2's complement into **RAM** starting from **60H** onwards.	2	2	1	3
3.	Justify why configuring Timer in mode-1 is not suitable for achieving UART baud for 8051 microcontroller?	2	1	2	1
4.	Assume that you are asked to generate **5ms** ON pulse with 50% duty-cycle on P2.0 GPIO pin of 8051 by using **Timer-0** in **Mode-1** using **interrupt mode**. Which SFRs will you propose to configure with what values?	2	3	3	2
5.	Draw the 8255 PPI interfacing circuit with 8051 to get 2000H, 2001H, 2002H and 2003H as the Ports–A, B, C and Control Register addresses respectively.	2	4	4	3
6.	Write the output current expression I_{OUT} of DAC0808 when interfacing it with 8051. If I_{REF} = 2mA, find the output current for the binary sequence: 10110100?	2	3	4	2
7.	Which IC is used for interfacing a stepper motor to 8051? A stepper motor with the step-angle of **5°** will take how many steps per revolution?	2	2	4	1
8.	What is the significance of RS and EN pins of 2x16 monochrome LCD in interfacing with any Micro Controller Unit (MCU)	2	1	4	1
9.	List any two advantages of MSP430x controller compared with 8051.	2	2	5	1
10.	Give any two real-time applications where PWM of a controller is used.	2	2	5	1
	Part-B (5 ×10 = 50 Marks)				
11. a)	With the help of architectural block diagram, describe 8051 built in features, ROM and RAM organization. List any two 16-bit registers and draw the PSW format.	7	1	1	1
b)	Draw the pin diagram of 8051. List the alternate pin functionalities of P3.	3	1	1	1
12. a)	Explain UART configuration of 8051. Mention the steps to program UART in full duplex transceiver mode at 19200bps baud rate.	5	2	2	1
b)	Using 8051 interrupts, write a program in embedded-C (OR) in assembly to: (i) Continuously read the status of a single bit (indicating the switch status) from P1.7 to display on P1.0 which is connected to the LED. (ii) Simultaneously, generate a square wave of 200µs ON period on P2.5 using T0 in mode-2; And, (iii) Keep on transmitting the letter '**V**' via UART at 9600bps.	5	3	3	2

			M	L	CO	PO
13. a)	Draw the circuit of interfacing LM35 temperature sensor to 8051 using ADC0804. Mention the steps involved in converting analog into digital data.		5	2	4	2
b)	When do you recommend use of SRAM in microcontroller-based system design? Draw the circuit diagram of interfacing a 16KB SRAM (16Kx8-bits) chip with 8051 such that its address starts from 0x8000 to 0xFFFF. Give Assembly and C syntax of storing and retrieving the data from it.		5	3	4	2
14. a)	Develop a 4 x 3 matrix keypad driver either in C or in assembly indicating its circuit. What is key-debouncing problem? Propose the solution for it.		6	2	4	2
b)	Mention the use of Real Time Clock (RTC) in microcontroller-based system design. Draw the circuit of interfacing 8051 with DS12887 RTC.		4	2	4	2
15. a)	Propose the block level hardware diagram and write the software modules involved in an industrial automation project with the following requirement: Assume that an 8-bit digital pressure sensor is interfaced to P1 of 8051. Your application software must: (i) Continuously read the sensor data from P1. (ii) If the sensed reading is within the range of 20 to 75, then it is normal. (iii) An alert message: "**High**" (>75) or "**Low**" (<20) must be sent via UART at 9600bps baud, for other sensed values. (iv) Also, if the pressure is low, you must rotate a DC motor in clock-wise;on the other hand if it is high, it must rotate in anti-clock-wise until the pressure is normal.		7	4	4	3
b)	List the real-time applications where the external interrupts must be configured as level-triggered or edge-triggered under each category? In 8051, how do you achieve it?		3	3	5	2
16. a)	Write 8051 assembly program or embedded C program to hardcode the lookup table of 7-segment display interfaced to P0 at 400H and roll the numbers from'0' to '9' with intentional delay.		5	2	3	2
b)	What is MAX232? Mention its importance. Draw the circuit diagram of it when interfaced with 8051.		5	2	1	1
17.	**Answer any *two* of the following:**					
a)	With a circuit diagram, discuss how full-step sequence and half-step sequence is achieved when a stepper motor is interfaced with 8051 along with control on direction of rotation?		5	2	4	1
b)	Implement 2x16 LCD Driver in embedded-C to display following messages: Line-1: " **Welcome-To** " Line-2: "**Seminar on IoT!!**"		5	2	4	2
c)	Summarize the distinct advantages of ARM CPU compared with any microcontroller in general and 8051 in specific. List the main disadvantages of 8051, which are addressed by replacing 8051 with ARM.		5	2	5	1

M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PO: Programme Outcome

S. No.	Criteria for questions	Percentage
1	Fundamental knowledge (Level-1 & 2)	72.63%
2	Knowledge on application and analysis (Level-3 & 4)	27.37%
3	*Critical thinking and ability to design (Level-5 & 6) (*wherever applicable)	-

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