Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2019

Programme Name: B.Tech Mechatronics Engineering **Semester : IV**

Course Name : Embedded System **Time : 03 hrs**

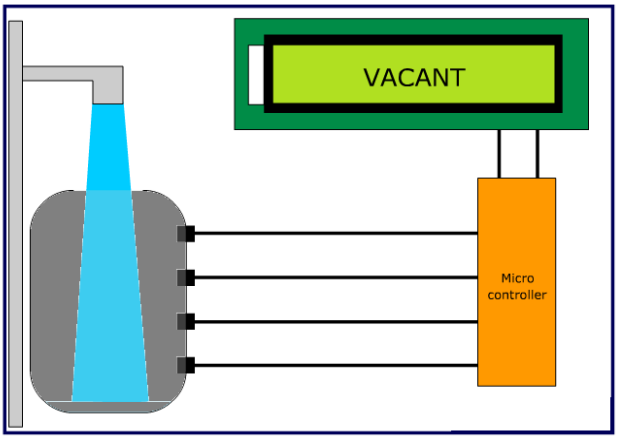
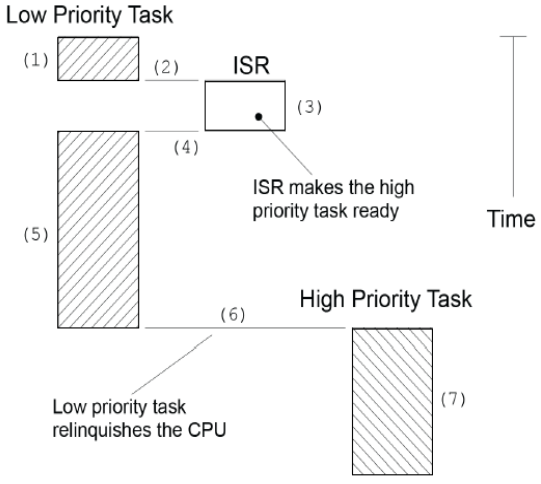
Course Code : ECEG 2003 **Max. Marks : 100**

Nos. of page(s) : 02

Instructions: Assume any data in programming, if required

SECTION-A (4 x 5 = 20 Marks)

S. No.	Attempt ***all*** the questions	**Marks**	**CO**
Q. 1	**(a)** what are the design matrices for the product development in embedded system. **(b)** Which operating mode of a microcontroller is useful in battery based embedded products.	**5**	**CO1**
Q.2	Compare LCALL and ACALL instructions for 8051 microcontroller. Find the size of the delay in following program for 8051 microcontroller, if the crystal frequency is 11.0592MHz. ***Machine Cycle*** DELAY:MOV R_2,#200 1 ***Machine Cycle*** AGAIN:MOV R_3,#250 1 ***Machine Cycle*** HERE: NOP 1 ***Machine Cycle*** NOP 1 ***Machine Cycle*** DJNZ R3,HERE 2 ***Machine Cycle*** DJNZ R2,AGAIN 2 ***Machine Cycle*** RET 2 ***Machine Cycle***	**5**	**CO2**
Q.3	Write the different addressing modes of 8051microcontrollers with examples. Write an assembly code for the square root of a number N. For, $X^2 = N$, Where N values lies between 0 to 9.	**5**	**CO2**
Q.4	(a) What is the difference between soft and hard real time systems. (b) What are the different states of a task in RTOS.	**5**	**CO4**
	SECTION-B (4 x 10 = 40 Marks)		
	Attempt ***all*** the questions		
Q.5	Explain the asynchronous data format and different modes of data transfer in serial communication. Discuss the Need of MAX 232 and DB-9 connector in serial communication.	**10**	**CO3**
Q.6	What are electromechanical relays? Explain the techniques to connect a solid-state relay with 8051 microcontrollers. Draw the interface diagram to control a fan and write a program to support the same functionality of the fan.	**10**	**CO5**
Q.7	Write the Embedded 'C' or Assembly code for the blinking 8 LEDs in alternate fashion with a delay of 1 ms. Draw the interface diagram to support your answer.	**10**	**CO1**
Q.8	Explain the all arithmetic and logical instructions of 8051 microcontroller with example.	**10**	**CO2**
	SECTION-C (2 x 20 = 40 Marks)		
Q.9	Comment on the H bridge logic configurations for dc motor control. Explain DC motor connection using Darlington Transistor and MOSFET switch. Based on the interface diagram, if a switch is connected to pin 2.7, WAP to monitor the status of Switch (SW) and perform the followings **(a)** If SW = 1, DC motor moves clockwise **(b)** If SW = 0, DC motor moves anticlockwise. **(c)** Discuss the power on reset circuit with and without momentary switch of 8051 microcontroller. Draw the block diagram, of 8051 microcontroller with RAM memory structure and complete description with SFR and bit addressable RAM.	**10** **10**	**CO5**

Q.10	Water level indicator is used in tanks to indicate the level of liquids and alert us when the tank is full. So, by the circuit we can monitor the various levels of the tank and can avoid spillage of water. We can configure our supplies according to the various levels of tank as shown in figure below. Such module or circuit can be installed in big buildings where manual monitor of tanks is difficult and its indicator can be placed at some centralized place.  Fig.1 Water tank controller Interface the LCD to 8051 microcontroller and write assembly language or embedded 'C' program to display the conditions of tank on LCD using 8051 microcontroller on LCD display for the conditions listed below in options (a), (b), (c), (d) and (e). It is optional to use the interface of 8255 PPI with 8051 microcontroller. **(a)** Vacant **(b)** Quarter **(c)** Half **(d)** Full Close tap **(e)** 3/ 4 of Full	**20**	**CO3**
Q.11	Detail the scheduling associated with the real time operation listed in fig.2. What type of problems can be associated with the execution of the scheduled task. Also suggest the solution and description of scheduling method.  Fig.2 **(b)** Give the details and examples of different types of semaphore applicable for RTS.	**10** **10**	**CO4**

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SECTION-A (4 x 5 = 20 Marks)

S. No.	Attempt ***all*** the questions	**Marks**	**CO**
Q. 1	How programs are classified for real time and non-real time tasks to separate the activities carried by the Embedded system.	**5**	**CO1**
Q.2	Compare LJMP and SJMP instructions for 8051 microcontroller. Find the size of the delay in following program for 8051 microcontroller, if the crystal frequency is 11.0592MHz. ***Machine Cycle*** DELAY:MOV R_2,# 100 1 ***Machine Cycle*** AGAIN:MOV R_3,# 150 1 ***Machine Cycle*** HERE: NOP 1 ***Machine Cycle*** NOP 1 ***Machine Cycle*** DJNZ R3,HERE 2 ***Machine Cycle*** DJNZ R2,AGAIN 2 ***Machine Cycle*** RET 2 ***Machine Cycle***	**5**	**CO2**
Q.3	Write the different addressing modes of 8051microcontrollers with examples. Write an assembly code for the square root of a number N. For, $X^3 = N$, Where N values lies between 0 to 9.	**5**	**CO2**
Q.4	Explain the foreground and background systems. Detail the role of different task states and their functionality with respect to RTS.	**5**	**CO4**

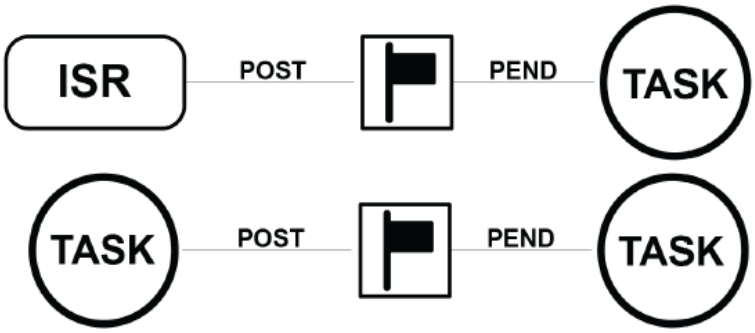
SECTION-B (4 x 10 = 40 Marks)

	Attempt ***all*** the questions		
Q.5	What is SSR and EMR. Detail the different types of EMRs. Interface an 8051 microcontroller with a lamp using optoisolator and write the code to support the functionality of the system	**10**	**CO5**
Q.6	Explain the asynchronous data format and different modes of data transfer in serial communication. Discuss the Need of MAX 232 and DB-9 connector in serial communication.	**10**	**CO3**
Q.7	Write the Embedded 'C' or Assembly code for display the common anode based 7 segment display with a delay of 1 ms in each display. Draw the interface diagram to support your answer.	**10**	**CO1**
Q.8	Explain the all arithmetic and logical instructions of 8051 microcontroller with example.	**10**	**CO2**

SECTION-C (2 x 20 = 40 Marks)

Q.9	**(a)** Is it possible to drive a DC motor using Darlington transistor. If yes, draw and explain the interface diagram, if No explain why. Two switches of DC motor are connected to pins P2.0 and P2.1 of 8051 microcontroller. Write an embedded 'C' program to monitor the status of both switches and perform the following.	**10**	**CO5**

SW2(P2.7)	SW1(P2.6)	Operation
0	0	DC motor moves slowly with 25 % duty cycle
0	1	DC motor moves moderately with 50 % duty cycle
1	0	DC motor moves fast with 75 % duty cycle
1	1	DC motor moves very fast with 100 % duty cycle

	(b) Discuss the power on reset circuit with and without momentary switch of 8051 microcontroller. Draw the block diagram, of 8051 microcontroller with RAM memory structure and complete description with SFR and bit addressable RAM.	**10**	
Q.10	**(a)** Interface the 8051 microcontroller with LCD (16 x 2). Detail the operation and Write the embedded 'C' / Assembly program to display "I LOVE UPES". **(b)** What is a key bouncing? Interface a keyboard to 8051 microcontroller and develop the code to support the display in matrix form. **0 1 2 3** **4 5 6 7** **8 9 A B** **C D E F**	**10** **10**	**CO3**
Q.11	(**a)** what are the different types of semaphore? Detail all with examples. What synchronization technique can be employed in fig.1 for synchronization task and ISR?  Fig.1 Task synchronization with ISR **(b)** Explain the preemptive and non-preemptive kernels and scheduling with examples.	**10** **10**	**CO4**