U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester: V**

Branch: Medical Electronics Engineering **Duration: 3 hrs.**

Course Code: 23MD5PCESD/ 22MD5PCESD **Max Marks: 100**

Course: Embedded System Design

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	*CO*	*PO*	Marks
1	a)	Discuss the role of Cache memory in embedded systems? How it is different from dynamic memory?	*CO1*	*PO1*	**06**
	b)	Explain how data can be transmitted bit by bit using the I2C bus. What is the disadvantage of I2C bus?	*CO1*	*PO1*	**09**
	c)	Discourse how power up reset is different from watchdog timer reset.	*CO1*	*PO1*	**05**
		OR			
2	a)	How embedded system is different from general purpose computing system?	*CO1*	*PO1*	**06**
	b)	What is SPI? Explain SPI master-slave topology. If it is required to connect multiple slaves, how can be slaves connected?	*CO1*	*PO1*	**09**
	c)	Design and explain the working of a hardware circuit for an embedded system to prevent a microntroller from unexpected program execution behavior when the supply voltage falls below a specified voltage.	*CO1*	*PO1*	**05**
		UNIT - II			
3	a)	Discuss operational quality attributes of an embedded system and exemplify their significance for medical embedded systems.	*CO1*	*PO1*	**10**
	b)	Design a coin operated public telephone unit based on FSM model for the following requirements. 1. The calling process is initiated by lifting the receiver (off-hook) of the telephone unit 2. After lifting the phone the user needs to insert a 1 rupee coin to make the call. 3. If the line is busy, the coin is returned on placing the	*CO2*	*PO2*	**10**

			receiver back on the hook (on-hook) 4. If the line is through, the user is allowed to talk till 60 seconds and at the end of 45th second, prompt for inserting another 1-rupee coin for continuing the call is initiated 5. If the user doesn't insert another 1-rupee coin, the call is terminated on completing the 60 seconds time slot. 6. The system is ready to accept new call request when the receiver is placed back on the hook (on-hook) 7. The system goes to the 'Out of Order' state when there is a line fault			
			OR			
	4	a)	Discuss nonoperational quality attributes of an embedded system and exemplify their significance for medical embedded systems.	*CO1*	*PO1*	**10**
		b)	Develop and explain the finite state machine model for an automatic chocolate vending machine for the following requirements 1. The tea/coffee vending is initiated by user inserting a 5-rupee coin. 2. After inserting the coin, the user can either select 'Coffee' or 'Tea' OR 3. Press 'Cancel' to cancel the order and take back the coin	*CO2*	*PO2*	**10**
			UNIT - III			
	5	a)	Differentiate between Emulator and Simulator used in the development of an embedded system.	*CO1*	*PO1*	**07**
		b)	What do you mean by board bring up in an embedded system environment?	*CO1*	*PO1*	**06**
		c)	How In System programming is different from out of circuit programming?	*CO1*	*PO1*	**07**
			OR			
	6	a)	Discuss the significance of various files generated during cross compilation	*CO1*	*PO1*	**07**
		b)	Elaborate on debugging process in embedded system development	*CO1*	*PO1*	**06**
		c)	Discuss the binary executable file generation and its format in embedded system environment	*CO1*	*PO1*	**07**
			UNIT - IV			
	7	a)	In a manufacturing plant which involve many processes, discuss how an operating system can achieve ownership lock and signal mechanism.	*CO3*	*PO2*	**07**

<table>
<tr><td></td><td></td><td>b)</td><td>Assume that following processes are scheduled using Round Robin algorithm. Time assigned for each process is 3 Quantum. Sketch ready Queue and Gantt chart of the process execution. Calculate total completion time, turnaround time and waiting time for each process
<table><tr><th>Process</th><th>Arrival time</th><th>Burst Time</th></tr><tr><td>P1</td><td>0</td><td>8</td></tr><tr><td>P2</td><td>1</td><td>1</td></tr><tr><td>P3</td><td>2</td><td>3</td></tr><tr><td>P4</td><td>3</td><td>2</td></tr><tr><td>P5</td><td>4</td><td>6</td></tr></table></td><td>CO3</td><td>PO2</td><td>08</td></tr>
<tr><td></td><td></td><td>c)</td><td>Discuss the various queues maintained by real time OS in association with CPU scheduling?</td><td>CO3</td><td>PO2</td><td>05</td></tr>
<tr><td></td><td></td><td></td><td>OR</td><td></td><td></td><td></td></tr>
<tr><td></td><td>8</td><td>a)</td><td>Describe the various states of a task in RTOS.</td><td>CO3</td><td>PO2</td><td>07</td></tr>
<tr><td></td><td></td><td>b)</td><td>Consider the following table of arrival time and burst time for five processes P1, P2, P3, P4 and P5. If the CPU scheduling policy is FCFS, show the Gantt chart and calculate the average waiting time and average turnaround time.
<table><tr><td>Processes</td><td>Arrival Time</td><td>Burst Time</td></tr><tr><td>P1</td><td>2</td><td>6</td></tr><tr><td>P2</td><td>5</td><td>2</td></tr><tr><td>P3</td><td>1</td><td>6</td></tr><tr><td>P4</td><td>0</td><td>3</td></tr><tr><td>P5</td><td>4</td><td>4</td></tr></table></td><td>CO3</td><td>PO2</td><td>08</td></tr>
<tr><td></td><td></td><td>c)</td><td>Discuss the PCB in interprocess communication. How is task different from a thread?</td><td>CO3</td><td>PO2</td><td>05</td></tr>
<tr><td></td><td></td><td></td><td>UNIT - V</td><td></td><td></td><td></td></tr>
<tr><td></td><td>9</td><td>a)</td><td>With necessary sketches, describe hardware and software requirements for an Automated chocolate vending machine</td><td>CO4</td><td>PO3</td><td>10</td></tr>
<tr><td></td><td></td><td>b)</td><td>Develop multiple tasks and their synchronization model for ACVM using semaphores and mailbox messages. Deliberate the flow of operations</td><td>CO4</td><td>PO3</td><td>10</td></tr>
<tr><td></td><td></td><td></td><td>OR</td><td></td><td></td><td></td></tr>
<tr><td></td><td>10</td><td>a)</td><td>Discuss the hardware architecture of a digital camera giving function of each block.</td><td>CO4</td><td>PO3</td><td>10</td></tr>
<tr><td></td><td></td><td>b)</td><td>Identify the necessary software components to design a digital camera</td><td>CO4</td><td>PO3</td><td>10</td></tr>
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