U.S.N.										

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

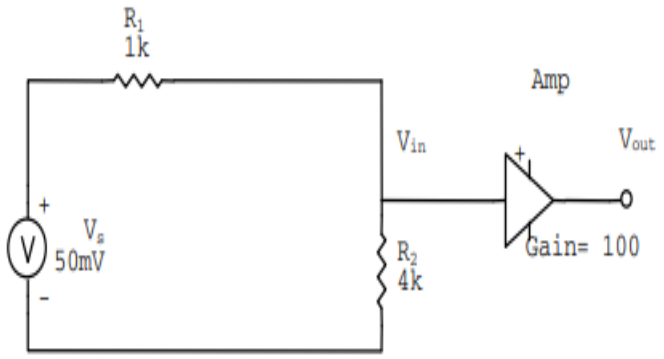
Autonomous Institute Affiliated to VTU

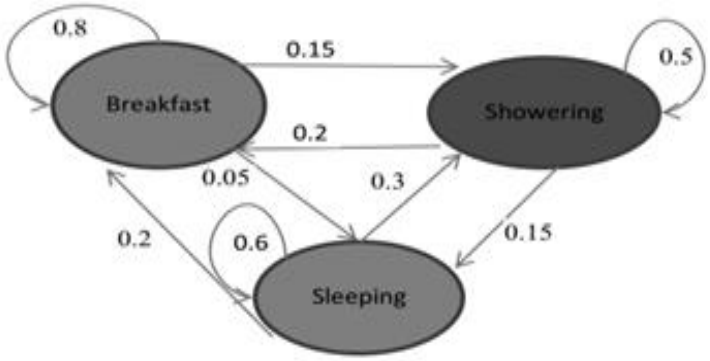
June 2025 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Electronics and Instrumentation Engineering **Duration: 3 hrs.**
Course Code: 23EI5PE1SE / 22EI5PE1SE **Max Marks: 100**
Course: Sensor Analytics and Edge Devices

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.

		MODULE- I	*CO*	*PO*	Marks
1	a)	Suggest a few light sensors available off-the-shelf which are used for environmental monitoring application with their features	CO1		**09**
	b)	A temperature sensor as shown provides an output of 1 mV/°C and has an output resistance of 1 kΩ. The sensor is connected to an amplifier of input resistance of 4kΩ. If the gain of the amplifier is 100, find the output of the amplifier for a temperature of 50°C.Justify the deviation in answer. 	CO2	PO1	**05**
	c)	Discuss few practical issues to be considered while designing a passive RC filter	CO2	PO1	**06**
		OR			
2	a)	Outline the humidity detection technologies that are available in the market, as well as address their advantages and disadvantages.	CO1		**10**
	b)	A displacement sensor is to be used to measure motion from 0 to 5cm. The resistance changes linearly over this range from 0 to 10kΩ. Develop a signal condition circuit to provide a linear 0 to 3.3 V output to directly interface to a microcontroller.	CO2	PO1	**05**
	c)	Discuss the working of a frequency domain reflectometry soil moisture sensor	CO2	PO1	**05**

			MODULE - II			
	3	a)	Deliberate with neat block diagram the wireless sensor network based on microcontroller and ZigBee communicating device.	*CO3*	*PO1*	**08**
		b)	Calculate the discharge current for battery for a backup time of 16 hours for a practical situation with the following specifications: Operating Voltage of the sensors ,V_S :3.3V Current requirement of the sensor, I_n : 0.1mA Current requirement for transmitting the data, I_{td} : 20 mA Time duration for transmission of data, t_{td} : 2µS Frequency of transmission , f_{td} :1KHz Time duration for transmission of data, t_{rd} : 1µS Frequency of transmission , f_{rd} :2KHz Efficiency of the power converter to convert the battery voltage to the voltage suitable to the sensor: 90% Battery voltage, V_B :7.8V	*CO3*	*PO2*	**06**
		c)	What are the challenges associated with energy harvesting techniques when used as a next generation energy source?	*CO3*	*PO2*	**06**
			OR			
	4	a)	With a neat block diagram, explain the working and function of a wireless sensor system	CO2	PO1	**10**
		b)	Discuss the different types of power supplies used for WSN applications	CO2	PO1	**10**
			MODULE - III			
	5	a)	Discuss the different data preprocessing techniques that are applied to sensor data in structural health monitoring application.	CO4	PO2	**10**
		b)	Explain the Hidden Markov model algorithm used to build activity recognition based applications.	CO4	PO2	**10**
			OR			
	6	a)	Discuss the Ant optimization algorithm used in structural health monitoring application	CO4	PO2	**07**
		b)	 Consider the Markov model given above for an elderly activity ,who is in breakfast now, what is the Probability that the eldery will be in breakfast the next day and the day after is sleeping?	CO4	PO2	**06**

		c)	Explain the Conditional random field algorithm used to build activity recognition based applications	CO4	PO2	**07**
			MODULE- IV			
	7	a)	Discuss the need for Machine learning in WSN applications	CO2	PO1	**10**
		b)	Explain any two learning algorithm used for machine learning widely used in node clustering and data aggregation problems where no labeled data is available.	CO4	PO2	**10**
			OR			
	8	a)	Explain the K- nearest neighbor machine learning algorithm used in WSN applications.	CO4	PO2	**10**
		b)	Discuss the ML techniques of clustering and data aggregation used in sensor nodes to save energy.	CO4	PO2	**10**
			MODULE - V			
	9	a)	Discuss the architecture of edge computing for an IOT application	CO2	PO1	**10**
		b)	Explain the inference workflow of toolkit used for deep learning. Also discuss the edge computing architecture developed by industry pioneers.	CO2	PO1	**10**
			OR			
	10	a)	Explain the unique features that make edge computing a promising technology	CO2	PO1	**10**
		b)	Discuss with examples the key technologies that use edge computing and ML	CO2	PO1	**10**

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