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

Autonomous Institute Affiliated to VTU

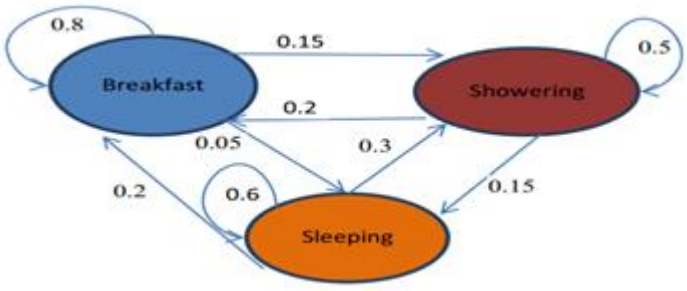
January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: 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 Thermal sensors available off-the-shelf which are used for environmental monitoring application with their features	CO1		**09**
	b)	A high-pass passive RC filter is to be designed to attenuate the undesired 50 Hz supply frequency noise. The useful signal is 1 kHz and above. Design the suitable R and C of the filter so that the 50 Hz signal gets eliminated and the useful signal is down only by 3 db.	CO2	PO1	**05**
	c)	Discuss the effect of change of bias and loading effect on sensor output	CO2	PO1	**06**
		OR			
2	a)	Outline the humidity detection technologies that are available on the market, as well as addresses 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)	Describe the criteria for selection of sensor for a WSN application	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 following specification 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	*CO3*	*PO2*	**06**

			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			
		c)	Discuss the challenges faced by energy harvesting techniques for 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 various 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 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 sleeping now, what is the Probability that the eldery will be in sleeping the next day and the day after is showering.	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)	Describe the nonfunctional challenges in WSN that are addressed using machine learning for future applications in a wireless sensor network.	CO4	PO2	**10**
			OR			

	8	a)	Explain the K- nearest neighbor machine learning algorithm used in WSN applications.	CO4	PO2	**10**
		b)	Discuss the future applications of Machine Learning techniques for a wireless sensor network.	CO4	PO2	**10**
			MODULE - V			
	9	a)	Discuss the architecture of edge computing for an IOT application	CO2	PO1	**10**
		b)	Compare cloud computing and edge computing architectures.	CO2	PO1	**10**
			OR			
	10	a)	Explain the unique features that make edge computing a promising technology	CO2	PO1	**10**
		b)	Discuss the process flow of an inference platform to develop solutions which integrates AI and edge computing.	CO2	PO1	**10**

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