VIT
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Reg. Number:	22BCE1351

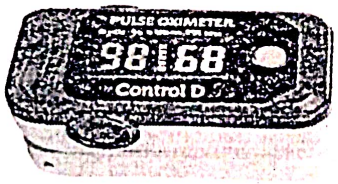
Continuous Assessment Test – I - JAN 2025

Programme	:	B.Tech (CSE)	**Semester**	:	WS 2024-2025
Course Code & Course Title	:	BCSE305L & Embedded Systems	**Class Number**	:	CH2024250501594 CH2024250501599 CH2024250501619 CH2024250501627 CH2024250501632 CH2024250501596
Faculty	:	VIJAYKUMAR P NITISH KATAL SINDHUJA M KIRAN KUMAR M SUHASINI SHARON GIFTSY A L	**Slot**	:	E1+TE1
Duration	:	90 minutes	**Max. Mark**		50

General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information.
- Use statistical tables supplied from the exam cell as necessary
- Use graph sheets supplied from the exam cell as necessary
- Only non-programmable calculator without storage is permitted

Answer all questions

Q. No	Sub Sec.	Description	Marks	Blooms Taxonomy Level
1.		Explain the different phases involved in the embedded system design process for designing a digital pulse oximeter to measure oxygen saturation level for the covid patients. Apply top-down approach.  i. A 32-bit ARM Cortex-M4 core, which supports digital signal processing (DSP) for filtering signals. ii. Measure oxygen saturation (SpO2) by observing pulse rate (heartbeats per minute) and display these values on a digital interface. iii. Provide real-time feedback and alert system. iv. Photodiode, one red and infra-red LEDs are used as sensors in oximeter are powered by Li-ion/LiPo battery with charging circuitry. v. Continuously update the display with calculated SpO2 and pulse rate in OLED. If needed, implement warning messages for abnormal readings (e.g., SpO2 < 90%).	10	K2

2.		With a neat sketch of the functional block diagram/architecture, describe the salient features available in the 8-bit microcontroller based on Harvard architecture.	10	K1
3.	a	Write an Arduino Program to develop a water level indicator installed in the water tank for greenhouse farming with an ADC interface involving detecting the level of water in the water tank. Alert the user or taking automated actions (like triggering a light or alarm). Draw the connection diagram and write a program to implement this system. [3+7 marks] i) If water level threshold is 200 – Display a message "Water level is low" in serial monitor and turn ON, the buzzer and LED should be High. ii) If water level threshold is 800 – Display a message "Water level is High" in serial monitor and turn OFF, the buzzer and LED should be High. iii) If water level is within the normal range (between 200-800) – Display a message "Water level is Normal" in serial monitor and turn OFF, the buzzer and LED should be Low.	10	K3
	b	List the unique characteristics for asynchronous transmission and reception of data through a serial communication using memory I/O interfacing.	5	K1
4		Write an Arduino code for automatic toll collection system. Vehicles passing through a toll booth are detected using an IR sensor. The system employs a timer/counter for the following operations: • Vehicle Detection and Toll Charging: When a vehicle passes the IR sensor, a timer starts to count the duration the vehicle takes to cross the booth. If the vehicle takes less than 10 seconds to cross, it is classified as a "Fast Vehicle" and a standard toll fee is applied. If the vehicle takes more than 10 seconds, it is classified as a "Slow Vehicle," and an additional surcharge is added to the toll fee. • Vehicle Flow Rate Monitoring: The counter keeps track of how many vehicles have passed through the toll booth in the past minute. • Overstay Detection: If a vehicle remains in the IR sensor's range for longer than 30 seconds, an alert is raised via a buzzer. Then the buzzer will be OFF after 5 seconds. Draw the connection diagram and write a program to implement this system. [3+12 marks]	15	K3