Roll No: | | | | | | | | | | | |

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

PRESIDENCY UNIVERSITY

Presidency University Act, 2013 of the Karnataka Act No. 41 of 2013 | Established under Section 2(f) of UGC Act, 1956
Approved by AICTE, New Delhi | Approved By BCI
Bengaluru

Mid Term Examinations - October 2026

Date: 06/10/2026 **Time:** 09:30 AM - 11:00 AM

Course Code: ECE3190 **Course Name:** Foundations of Electronics for Artificial Intelligence

Semester: Seventh Semester **Max. Marks:** 50 **Weightage:** 50%

CO - Levels	CO1	CO2	CO5
Marks	26	24	40

PART A: Answer Following Questions. 10 M

Q.N.	Questions	M	CO	BT
1	Define duty cycle	2	CO1	BT1
2	Differentiate between Flash memory and SRAM in an AI hardware system.	2	CO1	BT2
3	Explain how peripheral power gating reduces the average current drawn by an AI device.	2	CO1	BT2
4	State an example each of an active sensor and a passive sensor	2	CO2	BT1
5	Explain why sensor bandwidth should be greater than or equal to signal bandwidth.	2	CO2	BT2

PART B : Answer Any 1 Following Questions. 10 M

Q.N.	Questions	M	CO	BT
6	With the help of a labelled block diagram, explain the eight-stage AI hardware stack, describing the function of each block.	10	CO1	BT2
7	Explain the three power states of a microcontroller and describe how peripheral power gating and wake-on-interrupt reduce the average current drawn by an edge AI device.	10	CO1	BT2

PART C: Answer Any 1 Following Questions. 10 M

Q.N.	Questions	M	CO	BT
8	A dense (fully connected) neural-network layer with 784 inputs and 128 outputs is to run on a microcontroller (216 MHz clock, throughput 1 MAC/cycle). Calculate: (a) the total number of MAC operations required, (b) the theoretical minimum execution time, (c) a realistic execution-time range applying a 3×–5× real-world overhead.	10	CO5	BT3
9	A battery-powered AI security node wakes once every 5 minutes (300 s) to run a vibration-classification inference. In each cycle: MCU active for 80 ms at 12 mA; PIR sensor active for 40 ms at 3 mA; BLE status transmission for 30 ms at 12 mA; the node sleeps for the remainder of the cycle at 8 µA. Battery: 2000 mAh. Calculate: (a) the duty cycle of each active component, (b) the average current drawn by the node, (c) the resulting battery life in days.	10	CO5	BT3

PART D: Answer Any 1 Following Questions. 10 M

PTO (Please Turn Over)

Q.N.	Questions	M	CO	BT
10	Explain the construction and operating principle of (a) NTC Thermistor (b) Barometric pressure sensor	10	CO2	BT2
11	Explain the working, advantages and disadvantages of (a) Single-wire interface (b) SPI interface.	10	CO2	BT2

PART E: Answer Any 1 Following Questions. 10 M				
Q.N.	**Questions**	**M**	**CO**	**BT**
12	A wearable cough-monitoring AI patch must capture acoustic content up to 2 kHz. The chosen MCU's ADC is fixed at a 3 kHz sampling rate. Calculate: (a) the minimum Nyquist sampling rate for 2 kHz content, (b) whether the 3 kHz ADC is sufficient, (c) the aliased frequency at which a genuine 2.5 kHz component would appear when sampled at 3 kHz.	10	CO5	BT3
13	A budget PPG (photoplethysmography) heart-rate sensor's AC signal swings between −2 mV and +2 mV and is fed, unamplified, into a 10-bit ADC with a 3.3 V reference voltage. Calculate: (a) the fraction (%) of the ADC's input range the signal occupies, (b) the effective resolution (in bits) available for the PPG signal, (c) the minimum ADC bit depth needed for a 0.05 mV resolution on the same 3.3 V reference.	10	CO5	BT3