Name: **Enrolment No:**	

UPES

End Semester Examination, May 2025

Course: Bionics & Microprocessor **Semester: IV**

Program: B.Tech- Biomedical Engineering **Time: 03 hrs.**

Course Code: ECEG 2058 **Max. Marks: 100**

Instructions: Attempt all the questions

S. No.	Section A True & False (20Qx1.5M= 30 Marks)	Marks	COs
Q 1	The development of bionic organs focuses only on cosmetic appearance, not functional restoration.	**1.5**	**1**
Q 2	Biological locomotion principles have no application in designing robotic movement strategies.	**1.5**	**1**
Q 3	Advanced materials used in bioengineering are always made from synthetic, non-biodegradable sources.	**1.5**	**1**
Q 4	Swarm robotics is inspired by the collective behavior observed in biological organisms like ants and bees.	**1.5**	**1**
Q 5	Historical evolution of bionics shows that early bionic designs were heavily influenced by mechanical engineering rather than biological systems	**1.5**	**1**
Q 6	Energy and powering issues are major challenges in creating efficient and long-lasting bionic devices.	**1.5**	**1**
Q 7	Fabrication technologies at micro and nano scales are crucial for advancing bionics and bio robotics.	**1.5**	**1**
Q 8	Bioinspired structural designs often lead to more lightweight and efficient materials in robotics.	**1.5**	**1**
Q 9	Morphological computation relies on the idea that the physical structure of a robot can simplify its control processes.	**1.5**	**1**
Q 10	Bionics has examples like robotic fish that mimic the swimming mechanisms of real fish.	**1.5**	**1**
Q 11	Instrumentation amplifiers are commonly used in analog front-end circuits to amplify small sensor signals while minimizing noise.	**1.5**	**2**
Q 12	Filters in an analog front-end are used to amplify the incoming signal rather than to remove unwanted frequencies.	**1.5**	**2**
Q 13	ADC (Analog-to-Digital Converters) are responsible for converting digital signals into analog signals.	**1.5**	**2**

Q 14	Digital interfaces are used to transfer digitized sensor data from the analog front-end directly to an embedded microcontroller.	**1.5**	**2**
Q 15	Designing electronic systems for wearable applications must prioritize energy efficiency to ensure longer operational life.	**1.5**	**2**
Q 16	Microcontrollers are generally more integrated and optimized for control tasks compared to microprocessors.	**1.5**	**3**
Q 17	The 8051 microcontroller belongs to the MCS-51 family and features Harvard architecture.	**1.5**	**3**
Q 18	In the 8051-instruction set, there is no support for indirect addressing modes.	**1.5**	**3**
Q 19	An ADC (Analog-to-Digital Converter) cannot be interfaced directly with an 8051 microcontroller.	**1.5**	**3**
Q 20	All 8-bit microcontroller families have identical architecture and instruction sets.	**1.5**	**3**
Section B (4Qx5M=20 Marks)			
Q 1	Summarize the concept of bionics and explain its major applications.	**5**	**1**
Q 2	Explain the concept of bioinspired structural design and advanced materials with relevant examples.	**5**	**2**
Q 3	What are the principles of morphological computation.	**5**	**3**
Q 4	Explain the role of microcontrollers and computers in bionics engineering and bio robotics, providing suitable examples.	**5**	**4**
Section C (2Qx15M=30 Marks)			
Q 1	Design a program to perform a cyclic right shift of LEDs on an 8051 microcontroller and explain its functionality.	**15**	**3**
Q 2	How would you interface a specific temperature sensor with a microcontroller in a real-world application? Include necessary components.	**15**	**4**
Section D (2Qx10M=20 Marks)			
Q 1	How can different addressing modes be applied in programming the 8051 microcontrollers? Give examples.	**10**	**3**
Q.2	Compare microprocessors and microcontrollers in terms of their components, functions, and typical uses.	**10**	**4**