Biology for Engineers-Question Bank (**Only sample Questions)**

Module 3

1. Compare Human Brain with CPU.
2. Describe the role of rod and cone cells in vision adaptation under different lighting conditions. How can this biological adaptation inspire the development of smart camera sensors?
3. Compare the working principles of a bionic eye and a natural human eye. What are the major engineering challenges in replicating human vision?
4. How can **AI-based ECG monitoring** help in the **early detection of cardiac abnormalities**?
5. What engineering techniques are applied to develop **AI-driven retinal implants** for vision restoration?
6. How does **ECG signal processing** help in automatic heart disease diagnosis? Give examples of engineering applications where AI is integrated into ECG analysis.
7. How do **robotic arms** mimic **natural human hand movements** using neuromuscular signals?
8. Describe how **EEG-based systems** can be integrated into **prosthetic limb control**.
9. How do **biodegradable stents** help in avoiding long-term complications in heart patients?
10. Define **EEG (Electroencephalography)** and explain its role in **brain signal processing for brain-computer interfaces (BCI)**.
11. What are the key engineering principles used in the design of **robotic prosthetic limbs**?
12. List various **biomaterials** used in the design of **stents for treating blood vessel blockages**.
13. Discuss the importance of robotic prosthetics in modern medicine.
14. How do synthetic lenses help in vision correction post-cataract surgery?
15. Explain the significance of a pacemaker as an engineering solution for heart rhythm disorders. How does it help in regulating cardiac function, and what advancements have improved its effectiveness?"
16. Explain how **brain-machine interfaces (BMIs) enable robotic prosthetic arms** to be controlled by thought.

Module 4

1. Explain how the **lungs function as a purification system** and compare this process to an engineering filtration system.
2. How does the **gas exchange mechanism in the lungs** resemble diffusion-based filtration in industrial applications?

3. What is **spirometry**, and how does it help in assessing lung function? Explain its engineering principles.
4. Describe the **working mechanism of a ventilator**. How does it assist the lungs in respiration?
5. How does **dialysis work** in patients with kidney failure? Explain its similarity to industrial filtration techniques.
6. What are the **major structural components of the musculoskeletal system**, and how do they act as natural scaffolds?
7. How do **bioengineered scaffolds** help in treating osteoporosis? Provide an example of an engineering application.
8. What is the role of the **heart-lung machine** during surgeries? How does it mimic the function of natural organs?
9. Discuss the role of **3D bioprinting** in musculoskeletal regeneration. What challenges need to be overcome for successful implantation?
10. What role do **biomaterials** play in **bone scaffolding and regeneration**? Provide examples of engineering applications.

Module 6

1. Explain the basic principles and key **materials used in bioprinting**, and how do they support artificial organ development?
2. Explain the **working principles of 3D bioprinting** and explain its types.
3. How does **3D printing of skin** help in treating burn victims?
4. Discuss the **engineering challenges in 3D printing functional bones** for medical applications.
5. What is the role of **bio-inks** in the development of **3D-printed artificial organs**?
6. How do **electronic tongues and electronic noses** work in food science? Provide an engineering perspective.
7. Explain the concept of **DNA origami** and its potential applications in **biocomputing**.
8. How does **bioimaging** assist in **AI-based disease diagnosis**? Provide an example
9. Compare the features of **NCBI, DDBJ, and EMBL** nucleic acid databases.
10. What is **Entrez**, and how does it help in searching biological information?
11. Explain the **step-by-step process of bioprinting an artificial organ**. What are the limitations and future improvements?
12. How does **3D printing help in developing artificial ears, bones, and skin**? Compare their structural and functional properties with natural tissues.
13. Explain the **bioprinting process**, including the role of **bio-inks and scaffolds**.

14. Discuss the **engineering principles behind 3D printing of bones**. How does it mimic natural bone properties?
15. Describe the **bioprinting materials** used for 3D printing **ear, bone, and skin**. How are they selected for different applications?
16. What are the **key differences between NCBI, DDBJ, and EMBL**? How does each serve biological research?
17. How does the **Entrez search engine** assist researchers in finding relevant genetic and protein sequence data?