

# CBCS SCHEME

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21BE45

## Fourth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Biology for Engineers

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Explain the structure and classification of carbohydrates, focusing on monosaccharide, disaccharides and polysaccharides. Discuss their biomedical importance of carbohydrates. (10 Marks)
- b. Explain the construction, properties and importance of cellulose-based water filters. (05 Marks)
- c. Discuss the properties, engineering applications and environmental impact of pHA and PLA as bioplastics. (05 Marks)

OR

- 2 a. Discuss the importance and potential applications of DNA and vaccines using rabies as an example. Explain how DNA vaccines work. (10 Marks)
- b. Explain the properties, advantages and engineering applications of RNA vaccines, specifically for COVID-19. (05 Marks)
- c. Discuss the benefits and uses of plant-based proteins as alternatives to animal-based proteins. (05 Marks)

### Module-2

- 3 a. Compare and write architecture of the human brain as a CPU system with that based on their characteristics. (10 Marks)
- b. What is EEG? Write the application of EEG. (05 Marks)
- c. Eye act as camera. Explain with diagram. (05 Marks)

OR

- 4 a. Describe the architecture of the heart as a pump system. Discuss the function of each chamber. (10 Marks)
- b. Discuss the reasons for blockages in blood vessels and their implications for cardiovascular health. (05 Marks)
- c. Discuss the different shapes, materials, coating and expansion mechanisms used in stent design. (05 Marks)

### Module-3

- 5 a. Explain the architecture of the lungs as a purification system. Discuss the different parts of the respiratory system and their role in filtering harmful substances and facilitating gas exchange. (10 Marks)
- b. Discuss the principle and working of spirometry as a diagnostic test for evaluating lung function. Explain how spirometry results can be interpreted and used in the diagnosis of lung conditions. (05 Marks)
- c. Explain the concept of abnormal lung physiology. Focusing on Chronic Abstractive Pulmonary Disease (COPD) as an example. (05 Marks)

OR

- 6 a. Describe the architecture of the kidney and its functional units. Known as nephrons. Discuss the role of each component of the nephron in the filtration, reabsorption and secretion processes. (10 Marks)
- b. Discuss the types of muscle and contract of muscle. (05 Marks)
- c. Explore the bioengineering solutions being developed for osteoporosis. (05 Marks)

Module-4

- 7 a. Explain the working principle of ultrasonography and discuss its advantages and limitations in medical imaging. (10 Marks)
- b. Discuss the history of technological echolocation. (05 Marks)
- c. Explain components of bionic leaf. (05 Marks)

OR

- 8 a. Compare between Birds and Aircrafts with GPS technology for Navigation and discuss. (10 Marks)
- b. Discuss the principle of super hydrophobic surfaces. (05 Marks)
- c. Discuss the materials and examples of self cleaning surface. (05 Marks)

Module-5

- 9 a. Elucidate the difference between 3D printer and Bioprinter. (10 Marks)
- b. Discuss technological importance of 3D printing of Human Ear. (05 Marks)
- c. Discuss materials used in 3D printing of Bone. (05 Marks)

OR

- 10 a. Evaluate the importance of 3D printing in the food industry. (10 Marks)
- b. Discuss the technological importance of self healing bio concrete. (05 Marks)
- c. Evaluate the advantages of bioremediation and biomining. (05 Marks)

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