

MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal 576104)

## V SEMESTER B.Tech.(BME) DEGREE END SEMESTER EXAMINATIONS NOVEMBER 2019 SUBJECT: MATERIALS SCIENCE FOR BIOMEDICAL ENGINEERING (BME 4013) (REVISED CREDIT SYSTEM) Friday, 22<sup>nd</sup> November 2019: 2 pm to 5 pm

## **TIME: 3 HOURS**

## MAX. MARKS: 50

## **Instructions to Candidates:**

**1.** Answer all the questions.

2. Draw labeled diagrams wherever necessary.

- 1. (a) Compare (a) Bohr and (b) wave-mechanical atom models in terms of electron 03 distribution and define principal, angular, magnetic and spin quantum numbers of an atom.
  - (b) Explain in detail the primary interatomic bonds. 02
  - (c) Criticize with explanation, the following statement. "H<sub>2</sub> (H $\rightarrow$  Hydrogen) is more 05 stable than H<sup>2+</sup>"
- 2. (a) Explain Temperature dependence of career concentration in n-type semiconductors 03
  - (b) Explain various possible electron band structures in solids at  $0^{\circ}$  K. 02
  - (c) The water content of an insulating oil is 1000 ppm at 30°C. Comment on the 05 breakdown strength of the insulating oil and predict any two possible breakdown mechanisms with explanation.

3.	(a)	Discuss field emission mechanism for electric breakdown of vacuum.	03
	(b)	Describe the limitations of Townsend's theory of dielectric breakdown	02
	(c)	Explain in detail the magnetic properties of antiferromagnetic and ferrimagnetic materials.	05

4.	(a)	Explain domain theory and hysteresis curve of ferromagnetic materials.	05
	(b)	Derive the relationship between magnetic flux density (B), magnetic field strength (H) and Magnetization (M).	03
	(c)	Why copper and gold appear red-orange and yellow respectively.	02
5.	(a)	Describe Barden Cooper and Schrieffer (BCS) theory of superconductivity.	05
	(b)	Recommend a suitable material for designing an infrared sensor with justification.	03
	(c)	"Type II superconductors are preferred over type I for most practical applications." Evaluate the above statement right or wrong with detailed justification.	02