Exam Date & Time: 21-May-2022 (10:00 AM - 01:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST SEMESTER B.TECH END SEMESTER EXAMINATIONS, MAY 2022

MATERIAL SCIENCE FOR BIOMEDICAL ENGINEERS [BME 4054]

Marks: 50 **Duration: 180 mins.**

A

Answer all the questions.

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1) "A Gold- silver alloy in which silver concentration is 1%, shows more resistance at 0K temperature than a pure gold sample." Justify the statement. (2)

A)

B) Compare (a) Bohr and (b) wave-mechanical atom models in terms of electron distribution and define principal, angular, magnetic and spin quantum numbers of an atom. (3)

C) Relate the temperature dependence of resistivity for a pure metal and a two-metal alloy. (5)

2) Relate macroscopic property ε_r and microscopic polarization phenomena, namely, α_e of dielectric materials with proper explanation (2)

A)

B) Discuss field emission mechanism for electric breakdown of vacuum (3)

C) Explain Temperature dependence of career concentration in n-type semiconductors (5)

3) When particles of ferromagnetic material suspended in water undergoes alternating magnetic field heat is generated. But it is observed that the temperature is not increasing above 45oC. Propose a reason for this. (2)

A)

B) Compare Hard Magnetic materials and soft magnetic materials (3)

C) A variable voltage source is connected to a copper anode and cathode. Argon gas is filled in between anode and cathode. Cathode surface contains micro-projections. Assume that no water vapour or impurities present in the argon gas. Explain the dielectric breakdown of the argon gas medium at higher voltages. (5)

4) Correlate between band gap and colour of a non-metallic material (2)

A)

B) Explain in detail the origin of permanent magnetic dipole in matter (3)

C) Illustrate and explain the reason for ferromagnetic materials showing magnetic hysteresis loop. (5)

5) What is ferroelectricity? Explain in detail

(2)

A)

B) Explain in detail the properties of Type I and Type II superconducting materials (3)

C) Recommend a suitable material for designing an infrared sensor with explaining in detail the corresponding material property (5)

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