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B. Tech 3rd Semester Examination

Electrical Engg. Materials & Applications (O.S.)

EE-3002

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all, select one question from each sections A, B, C and D. Section E is compulsory.

SECTION - A

1. (a) What do you mean by interatomic bonds? How these bonds influence resistivity amongst engineering electrical materials? **(10)**

   (b) What is superconductivity? Explain its applications in electrical engineering system. What are drawback of superconducting electrical systems? **(10)**

2. (a) Explain effect of temperature of low resistivity and high resistivity materials. **(5)**

   (b) Calculate the length of electric heater element having 0.4 mm diameter to get a resistance of 400 ohm and 1000 watts, if nichrome wire having resistivity of 100×10^{-8} ohm m is used in this product. **(10)**

   (c) Write main features and applications of Copper and Brass. **(5)**

SECTION - B

3. (a) What do you mean by electrical insulation materials? How these materials are characterised? **(3+5=8)**

(b) Classify various kind of insulation liquids that are used in electrical power apparatus. **(5)**

(c) Explain theory of development of insulation materials. **(7)**

4. (a) Give major electrical properties, general features of wood. Paper card board and insulating textiles. Write one application in respect of each alongwith limitations in their use. **(12)**

(b) Differentiate between Ceramics and Rubbers. **(8)**

SECTION - C

5. (a) How effectiveness of magnetic character is evaluated within a magnetic material? Enumerate various characteristic of an ideal and a practical magnetic material. **(4+6=10)**

(b) How susceptibility varies with temperature? **(4)**

(c) Write three applications of soft ferrites. Name the commercial aspect that limits its use in electronic industry. **(6)**

6. (a) What is Curie temperature? State its practical significance in engineering magnetic material selection process for electrical power apparatus. **(7)**

(b) How magnetic loss is evaluated in practice? **(5)**

(c) What is magnetostriction effect? State its impact on performance of an electromagnetic device. **(8)**

SECTION - D

7. (a) What do you mean by P-type and N-type Semi conducting materials? Name at least 3 such devices which use them for successful operation in practice. **(10)**

(b) What is difference between photo conductive cell and photovoltaic cell? Explain with neat circuit and operational diagram. **(10)**

8. (a) Compare characteristic conduction properties of metals. Semi-conductors and insulators through energy band diagram. **(10)**

   (b) How strain Gauges are finding greater applications in modern automation industries? **(5)**

   (c) State 3 uses of Rectifiers in process industries. **(5)**

SECTION - E

9. (i) Name two hygroscopic insulation materials.

   (ii) What is Teflon?

   (iii) What is a varnish?

   (iv) Name two superconducting materials.

   (v) How Bronze find engineering applications?

   (vi) What is critical temperature for super conductors?

   (vii) Write chemical formulae of a liquid insulation.

   (viii) How permitivity varies with temperature for an insulation?

   (ix) Can distilled water be used as coolant in power transformers?

   (x) What is magnetic anisotropy? **(2×10=20)**