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10EE666

Sixth Semester B.E. Degree Examination, July/August 2021
Electrical Engineering Materials

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. With the help of free electron theory, write a brief note on metallic conduction and hence derive the expression for electrical conductivity in metals. **(10 Marks)**

b. Explain in brief Fermi Dirac distribution using neat sketches. **(07 Marks)**

c. Discuss briefly the materials used for fuses and solders. **(03 Marks)**

2 a. An electric field of 80V/m is applied to a sample of n-type semiconductor whose hall co-efficient is $-0.0125 m^3/c$. Determine current density in the sample. Consider $\mu_c = 0.36 m^2/v/s$, $e = 1.6 \times 10^{19} C$. **(06 Marks)**

b. What are amorphous semiconductors? Give their applications. **(04 Marks)**

c. Classify the magnetic materials based on presence or absence of permanent magnetic dipoles and interaction between the individual dipoles. **(06 Marks)**

d. Bring out any four differences between hard and soft magnetic materials. **(04 Marks)**

3 a. Explain: i) Dipolar Polarization ii) Dipolar Relaxation iii) Dielectric loss. **(10 Marks)**

b. The capacitance of a condenser formed by two metal sheets each of $100 cm^2$ in area is $0.0002 \mu F$. A potential difference of 20,000V is applied across the plates separated by a dielectric of 2mm thick. Calculate: i) Charge on each plate ii) Potential gradient in KV/mm. **(06 Marks)**

c. Name the factors affecting dielectric strength in dielectric materials. **(04 Marks)**

4 a. With the help of a neat sketch, explain the testing of dielectric strength of a transformer oil. **(08 Marks)**

b. List out the properties of SF_6 gas. **(04 Marks)**

c. Explain the properties and applications of the following materials:
i) Mica ii) Asbestos iii) Bakelite iv) Paper. **(08 Marks)**

5 a. With the help of a block diagram, explain solar photovoltaic power generation system. Draw its V-I characteristics and list out the materials used for solar cells. **(08 Marks)**

b. With neat sketch, explain the working of a Fuel cell. **(06 Marks)**

c. Discuss the materials used in a Battery. **(06 Marks)**

6 a. What is optical microscopy? Name the types of optical microscopes. Explain in brief any one type of optical microscope. **(06 Marks)**

b. What is atomic absorption spectroscopy? Discuss. **(06 Marks)**

c. With necessary vector diagram, explain magnetic resonance. **(08 Marks)**

7 a. What is Piezoelectricity? What are the advantages, disadvantages and applications of piezoelectric devices? **(08 Marks)**

b. What is Magnetostriction? Explain the types of magnetostriction with neat graphs. **(06 Marks)**

c. Write a brief note on smart hydrogels and shape memory alloys. **(06 Marks)**

8 a. What are the general properties of ceramics? How ceramics are used in capacitors? **(08 Marks)**

b. Bring out the differences between thermo plastics and thermosetting plastics. Give examples for each. **(08 Marks)**

c. Write a note on Rubber. **(04 Marks)**

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.