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10EE666

Sixth Semester B.E. Degree Examination, June/July 2017
Electrical Engineering Materials

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer FIVE full questions, selecting at least TWO questions from each part.***
2. ***Support your answer with relevant diagram and equation if necessary.***

PART – A

1 a. Explain the effect of temperature on resistance and hence, derive an expression for the temperature coefficient of resistance. **(08 Marks)**

b. Explain the different materials that can be used for Lamp filaments. **(06 Marks)**

c. Calculate the resistance of a wire at 50°C, which is 300m long and has an area of cross-section of 25mm^2. The wire is made of aluminium. Resistivity of aluminium at 15°C is 2.7Ωm. Temperature coefficient of aluminium is 0.004Ω/°C at 0°C. **(06 Marks)**

2 a. Draw a typical hysteresis loop for a ferromagnetic material. Define residual magnetism and coercive force. **(08 Marks)**

b. With a necessary sketch explain the concept of Hall effect. **(06 Marks)**

c. The mobilities of silicon are $\mu_e = 0.17 m^2/V\text{-}s$ and $\mu_h = 0.035 m^2/V\text{-}s$ at room temperature. If the carrier density in the material is known to be 1.1×10^{16}, calculate the resistivity of silicon. **(06 Marks)**

3 a. Explain the following : i) Ionic polarization ii) Orientational polarization. **(10 Marks)**

b. A homogeneous slab of lossless dielectric material is characterized by a dielectric susceptibility of 0.12 and carrier of uniform flux density within it of 1.6 n C/m^2. Find the electric field, polarization, dipole moment and voltage across dielectric if there are 2×10^{19} dipoles per cubic meter and distance between opposite surfaces of dielectric is 2.54cm. **(10 Marks)**

4 a. Explain the procedure for testing the dielectric strength of transformer oil, with a neat sketch. **(08 Marks)**

b. What are the properties and applications of mica and glass? **(06 Marks)**

c. List out the properties of SF_6 gas. **(06 Marks)**

PART – B

5 a. What are the fuel cells? What are the major problems that are encountered in its commercial applications? **(08 Marks)**

b. Give the working principle of solar cell with its V-I characteristics. **(08 Marks)**

c. State the difference between hot mirror and cold mirror. **(04 Marks)**

6 a. Draw a neat sketch of electron microscopy and explain its working principle. **(08 Marks)**

b. How does magnetic resonance imaging work? **(06 Marks)**

c. List the applications of NMR and ESR. **(06 Marks)**

7 a. What is piezoelectricity? Explain the working of piezoelectric device and hence state its applications. **(08 Marks)**

b. What is rheology? Explain magnetorheological fluid with their modes of operation. **(08 Marks)**

c. Briefly explain magnetostriction. **(04 Marks)**

8 a. What are plastics? Explain the properties of plastics and give their classification. **(08 Marks)**

b. Explain the following :
i) Rubber ii) Thermostats iii) Applications of conductive ceramics. **(12 Marks)**

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