

Menoufia University
Faculty of Engineering, Shebin El-Kom
Electrical Engineering Department
Postgraduate-Master of science
Final Term Exam



Subject/Code: Electrical Materials/ELE 608
Year : 2016-2017
Time Allowed : 3 hours
Exam Date : 4 /1 / 2017
Total Marks : 100 marks

Allowed Tables and Charts: (None)

Answer the following questions

Question (1)

(25 Marks)

(1-a) What is meant by super-conductivity? Does it occur with all metals? Give three applications of superconducting materials.

(1-b) Discuss briefly the classification of engineering materials.

(1-c) Why aluminum is used in transmission and distribution of electrical power. However, copper is used in internal wiring and electrical machines winding.

(1-d) A resistance element having cross sectional area of 16 mm^2 and a length of 20 m takes a current of 2 A from a 220 V supply at ambient temperature of 20°C . Find the current when the temperature rises to 50°C . The resistance temperature coefficient at 20°C is $0.00025/^\circ\text{C}$.

Question (2)

(25 Marks)

(2-a) Mention four applications of nanotechnology in high voltage engineering.

(2-b) In your opinion, why there is a slight conductivity of intrinsic semiconductors at room temperature?.

(2-c) What is the difference between conventional and nanocomposites?.

(2-d) A conic section made of a material having a resistivity of $2.7 \times 10^{-6} \Omega \cdot \text{m}$. The two cross-sections of the conic sections are 5 cm^2 and 10 cm^2 , respectively. If the height of the conic section is 10 cm, calculate its resistance.

Question (3)

(25 Marks)

(3-a) Define each term: "resistivity", "hydrophobic", "superhydrophobic", and "nanofiller".

(3-b) Given three nanomaterials having the same particle size. These materials are ZnO, CdS, and Fe_2NiO_4 . Based on your studies, which material will give more increase in the breakdown voltage? Discuss the reasons for your choice.

(3-c) According to your studies, explain a possible mechanism for nanoparticle charging inside transformer oil when exposed to electrical stresses.

Question (4)

(25 Marks)

(4-a) Discuss the effect of adding nanosized carbon black to silicone rubber coatings over the surface of a high voltage porcelain insulator on its ice flashover performance.

(4-b) Explain, using suitable curves, the effect of semiconductive nonlinear coating on the electric field distribution over the surface of wet polluted insulation specimen.

(4-c) Discuss briefly the effect of nanofillers on short-term and long-term breakdown?

Good Luck Dr. Mohamed E. Ibrahim