

Menoufia University
Faculty of Engineering, Shebin El-Kom
Electrical Engineering Dep.
Academic Year: 2015-2016
Second Semester



Subject/Code: Electrical Materials/ ELE 122
Time Allowed : 3 hours
Exam Date : 1/ 6 / 2016
Total Marks : 85 marks
Year: 1st

Allowed Tables and Charts: (None)

Answer the following questions

Question (1)

(25 Marks)

(1.a) Read the following statements, then check [$\sqrt{\quad}$] or [\times] in front of each. Rewrite the wrong sentence after corrections.

- 1- ACSR conductor consists of a solid or stranded aluminium core surrounded by strands of steel. []
- 2- Conductivity of an intrinsic semiconductor increases with the increase in its temperature. []
- 3- Hard magnetic materials have higher hysteresis loss if compared to soft ones. []
- 4- Soil resistivity increases with the increase of moisture content. []
- 5- Touch potential is similar to "Step Potential" except that the fault current passes through the person's feet. []

(1.b) Compare between conductors, semiconductors, and insulators considering atomic structure.

(1.c) Describe the classification of superconducting materials.

(1.d) In a test to determine the resistance of a single-core cable, an applied voltage of 2.5 V was necessary to produce a current of 2 A in it at 15°C. (a) Calculate the cable resistance at 55°C if the temperature coefficient of resistance of copper at 0°C is 1/235 per °C. (b) If the cable under working conditions carries a current of 10 A at this temperature (55°C), calculate the power dissipated in the cable.

Question (2)

(20 Marks)

(2.a) Write short notes on: porosity – dielectric strength – chemical resistance – ionic polarization – electronic polarization.

(2.b) What are the factor affecting breakdown strength in dielectric materials?

(2.c) Discuss the factor affecting soil resistivity.

(2.d) An air capacitor of capacitance 0.005 μF is connected to a d.c. supply of 500 V. It is then disconnected from the supply and immersed in oil with a dielectric constant of 2.5. Find the energy stored in the capacitor before and after immersion.

Question (3)

(20 Marks)

(3.a) Explain briefly, with the aid of suitable sketches, forward and reverse bias of a pn-junction.

(3.b) Explain briefly, with the aid of suitable sketches, the construction, theory of operation, and characteristics of photovoltaic cells.

(3.c) Mention four applications of nanotechnology in high voltage engineering.

(3.d) The magnetic flux density within a bar of some material is 0.95 Tesla at an H field of $5 \times 10^5 \text{ A/m}$. Compute the following for this material: (a) the magnetic permeability, (b) the magnetic susceptibility, (c) the magnetization (M), and (d) What type(s) of magnetism would you suggest is (are) being displayed by this material? Why?

Question (4)

(20 Marks)

- (4.a) Explain briefly, with the aid of suitable sketches, the effect of semi conductive nanoparticles on tree growth in dielectric nanocomposites.
- (4.b) Explain briefly, with the aid of suitable curves, the effect of temperature on the magnetic properties of ferromagnetic materials.
- (4.c) Explain the two sources of magnetic moments for electrons.
- (4.d) What is nanotechnology, and in what is nanocomposite?

Good Luck **Dr. Amr m. Abdulhady**
Dr. Mohamed E. Ibrahim

This exam measures the following ILOs												
Skills	Knowledge & Understanding Skills				Intellectual Skills				Professional Skills			
	a3-1	a3-4	a21-1		b5-1	b5-2	b5-3	b6-1		c4-1		
Question Number	Q1-a,b,d	Q2-a, Q1a	Q4-c		Q2-b Q4-a,b,c	Q2c,d Q5a	Q3-a	Q3b,c		Q3-d		