



Allowed Tables and Charts: (None)

Answer the following questions

Question (1)

(25 Marks)

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

- 1- The best insulators have one electron in their outermost orbits or valence rings. []
- 2- Mechanical stress of crystal structure increases the resistivity of metal because the electron movement is interfered by the localized stains. []
- 3- The cable insulation resistance is increases as its length increases. []
- 4- As age of insulation material is increased the insulation resistance increases. []
- 5- Moisture increases the insulation dielectric loss. []

(1.b) Discuss the factors affecting the resistivity of electrical materials?

(1.c) write short notes on: Superconductivity - ACSR – Meissner effect

(1.d) A resistor of 80Ω resistance having a temperature coefficient of $0.0021/C^\circ$ at $0 C^\circ$ is to be constructed. Wires of two materials (A and B) of suitable cross-sectional area available. For material A the resistance is 80Ω per 100 m and temperature coefficient is $0.003/ C^\circ$ at $0 C^\circ$. For material B the resistance is 60Ω per 100 m and temperature coefficient is $0.0015/ C^\circ$ at $0 C^\circ$. Calculate suitable lengths of the wires of materials A and B to be connected in series to get required resistor.

Question (2)

(20 Marks)

(2.a) Write short notes on: Insulation resistance – Breakdown strength – dielectric constant.

(2.b) Discuss the types of polarization in dielectric materials.

(2.c) A capacitor consist of two metal plates, each 10 cm square placed parallel and 3 mm apart. The space between the plates is occupied by a sheet of insulating material 3 mm thick with dielectric constant of 3. The capacitor is charged to 300 V. If the metal plates are isolated from the 300 V supply and the insulating plate is removed, what is expected to happen to the voltage between the plates? Then if the metal plates are moved to a distance of 6 mm apart, what is the further effect on the voltage between them.

Question (3)

(20 Marks)

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

(3.b) Discuss the effect of temperature on the solar cell characteristics. What are the power losses in solar cells?

(3.c) A 100 cm² solar cell at 25 °C has $J_0=1$ pA/cm², in full sun it produces a short circuit current density of $J_{sc}=40$ mA/cm². Consider ideal cell, find the open circuit voltage at full sun and again at 50% shade. Draw this IV-curve.

Question (4)

(20 Marks)

(4.a) What is the nanotechnology? Mention five applications of nanotechnology in high voltage engineering.

(4.b) What are the factors influencing severity of electrical shock?

(4.c) How to recognize electrical hazards?

(4.d) Write short notes on: Origins of Magnetic Moments - Diamagnetism – Paramagnetism.

Good Luck Dr. Amr M. Abdulhady
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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			