R22 Regulation *Subject code:4O5BB*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech V Semester Supplementary Examinations, April 2026

ELECTRICAL ENGINEERING MATERIALS

(EEE)

Maximum Marks: 60 Date:24.04.2026 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X1M=10 Marks)		Marks	CO	BTL
1.a)	Define dielectric strength and breakdown voltage	1M	1	1
b)	Define leakage current in dielectrics	1M	1	1
c)	Define ferrites and mention one application.	1M	2	1
d)	What is spontaneous magnetization?	1M	2	1
e)	What are silicon wafers?	1M	3	1
f)	Differentiate between conductors and semiconductors.	1M	3	2
g)	What is a fuse element and what materials are used for it?	1M	4	1
h)	Define soft solder and hard solder.	1M	4	1
i)	Define galvanization.	1M	5	1
j)	Define structural materials.	1M	5	1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
2	Describe the types of polarization mechanisms in dielectric materials and their dependence on temperature and frequency.	10M	1	3
	OR			
3	a) Explain the concept of Curie Point and its significance in ferroelectric materials.	5M	1	2
	b) Discuss the properties of ferromagnetic materials in static fields and explain spontaneous magnetization.	5M	1	2
4	Discuss the concept of spontaneous magnetization and its temperature dependence using the Weiss molecular field theory.	10M	2	2
	OR			
5	a) Derive the relation between magnetic field strength (H), magnetization (M), and magnetic flux density (B).	5M	2	4
	b) A magnetic material has a magnetization $M=2.5\times10^5$ A/m and is placed in a magnetic field of strength $H=10^4$ A/m. Find the flux density B in the material. (Given $\mu_0=4\pi\times10^{-7}$ H/m).	5M	2	1

6	Discuss the steps involved in the fabrication of integrated circuits (ICs).	10M	3	2
	OR			
7	Describe the effect of temperature on carrier concentration and conductivity in semiconductors.	10M	3	3
8	a) Discuss materials used for resistors, rheostats, and heaters. b) Explain the selection criteria for conductor materials in transmission lines.	5M 5M	4 4	2 2
	OR			
9	A nichrome wire is used in a heater carrying 5 A at 230 V. Calculate the resistance and length if resistivity = 1.1×10^{-6} Ω·m and area = 0.8 mm^2.	10M	4	2
10	Describe galvanization and impregnation processes used for material. Write short notes on radioactive and structural materials.	5M 5M	5 5	3 1
	OR			
11	A transformer oil sample has breakdown voltages of 22, 25, 27, 28, 26, 30, and 29 kV. Calculate the average breakdown voltage and comment on its quality as per ISI standards protection.	10M	5	2