

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/Backlog), November 2016

B. Tech./B. Tech+M. Tech (Branch: Electronics & Communication Engineering), Semester IV

Roll No.....

ECE405: Engineering Materials and Processes

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.
4. Mobiles are not allowed during examination.
5. Non-programmable calculator is allowed.

Q.1A Objective type multiple choice questions (10 questions @ 1 mark)

10

- i. Magnetic moment of an atom is due to
 - (a) orbital motion of electron
 - (b) spin motion of electron
 - (c) both orbital and spin motion
 - (d) none of these
- ii. A non-polar molecule is the one in which the center of gravity of positive and negative charges
 - (a) coincides
 - (b) gets separated by 10^{-8} m
 - (c) gets separated by $1 \text{ \AA}$
 - (d) None of these
- iii. In superconducting state, the material becomes
 - (a) ferromagnetic
 - (b) perfect diamagnetic
 - (c) strong paramagnetic
 - (d) ferrimagnetic
- iv. An LED uses
 - (a) a conductor junction
 - (b) a semiconductor junction
 - (c) an insulator junction
 - (d) a quasi-element junction
- v. Which of the following material can have positive permeability and negative susceptibility?
 - (a) diamagnetic
 - (b) ferromagnetic
 - (c) paramagnetic
 - (d) none of these
- vi. In semiconductors, the electrical conductivity is proportional to concentration of carriers.

[True/False]

- vii. Soft magnetic materials are used to make recording heads. [True/False]
- viii. Electronic polarization independent of temperature. [True/False]
- ix. Point defects are present in crystalline materials. [True/False]
- x. Dielectrics are the materials which are insulators. [True/False]
- Q.2 Short answer type questions (4 questions @ 2.5 marks) 10
- Explain, why the introduction of a dielectric slab between the plates of a capacitor changes its capacitance?
 - Write a short note on electronic properties of Silicon, Gallium Arsenide.
 - What is the Meissner effect?
 - What are the different types of ceramic capacitors?
- Q.3A Describe a method, other than conventional etching, of printing a circuit on an insulated laminate with copper foil. 05
- Q.3B Explain the phenomenon of polarization of dielectric. What are the different types of dielectric materials? 05
- Q.4A What is the piezo-electricity? Explain the working and piezo-electric concept behind the working of piezo-electric transducers, gas ignitors, and piezo-electric transformers. 05
- Q.4B What do you know of the dielectric losses? Discuss the factors which affect the dielectric loss. 05
- Q.5A What is a crystal lattice and defects produced during the growth of crystals? Discuss the method of studying the crystal structure. 05
- Q.5B Explain with neat sketch the direct and indirect bandgap semiconductors with stating the applications of them. 05
- Q.6A Describe the hysteresis curve for soft and hard magnetic materials. How hard and soft magnetic materials can be used in different applications? 05
- Q.6B The hysteresis loop of a transformer has an area of 2500 ergs/cm^3 . Calculate the loss of energy per hour at 50 Hz frequency. The density of iron is 7.5 g/cm^3 and weight is 10 kg. 05

OR

Q.6B Determine the magnetization and flux density in silicon, if its magnetic susceptibility is -4.2×10^{-6} and the magnetic field in it is $1.19 \times 10^5 \text{ Am}^{-1}$. What would be the value of the relative permeability of the material? 05

Q.7A What is the method of Zone-refining? Explain the procedure with neat diagram. 05

Q.7B If the dielectric constant of a gas is 1.000039 at 0°C , determine its electric susceptibility at the same temperature. 05

OR

Q.7B Find the intrinsic conductivity of Si at room temperature, if the carrier density is 3.2×10^{13} . Given the electron mobility $\mu_n = 3600 \text{ cm}^2/\text{Vs}$, hole mobility $\mu_p = 1800 \text{ cm}^2/\text{Vs}$. 05

Q.8 What is diamagnetic material? Explain the Langevin's classical theory of diamagnetism and hence derive an expression for the susceptibility of a diamagnetic material. 10

Q.9A Define resistivity and mention factors affecting resistivity of electrical materials. Discuss some uses of low resistivity materials. 10

Q.9B Explain the term superconductivity. What is Magnetic Levitation? Why do trains based on maglav have the potential to reach very high speed? Explain the concept using neat diagram. 10

OR

Q.9B Compare the following with regard to their advantages and disadvantages: metal cored PCB *vs.* flexible PCB; double-sided PCB *vs.* single-sided PCB. 10