

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/Backlog), May 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.	Piezoelectric effect is the production of electricity by varying (a) current (b) voltage (c) electric field strength (d) pressure	
ii.	In a dielectric, the electronic polarizability (a) increases with temperature (b) decreases with temperature (c) is independent of temperature (d) may increase or decrease with temperature	
iii.	When a dielectric material is placed in an external a. c. electric field of frequency f , then at high frequencies ($f > 10^{14}$ Hz), the contribution comes solely from (a) electronic polarization (b) dipolar polarization (c) ionic polarization (d) atomic polarization	
iv.	The area of I-H loop for soft iron compared to that of steel is (a) more (b) less (c) equal (d) none of these	
v.	An example of amorphous solid is (a) diamond (b) graphite (c) salt (d) quartz sand	
vi.	The maximum energy possessed by an electron at absolute zero of temperature is called (a) fermi energy (b) de Broglie energy (c) energy gap energy (d) none of above	
vii.	An example of amorphous solid is (a) diamond (b) graphite (c) salt (d) quartz sand	
viii.	The magnetic susceptibility of a superconductor is	



	(a) -1	(b) +1	(c) 0	(d) none of these	
ix.	A mixed state of normal and superconducting regions (vortex state) is observed (a) only in type-I superconductors (b) only in type-II superconductors (c) in both type-I and type-II superconductors (d) none				
x.	The temperature at which a conductor becomes a superconductor is known as (a) Curie temperature (b) Onne's temperature (c) Critical temperature (d) none				

Q.2	Short answer type questions (4 questions @ 2.5 marks)	10
i.	What are the applications of the hard and soft magnetic materials?	
ii.	What is meant by Spontaneous Magnetization?	
iii.	What is Magnetic Levitation?	
iv.	What is meant by active and passive elements?	

Q.3A	What are the various laminates used as Printed Circuit Board (PCB) bases? List the merits of each type and the kind of materials used in it?	05
Q.3B	Find the current flowing at the instant of switching on a 100 watt metal filament lamp on to a 220 V circuit. Given that the incandescent filament temperature is 2000 °C and the resistance temperature coefficient at room temperature of 20 °C is 0.005.	05

Q.4A	What is diamagnetic material? Derive an expression for the susceptibility of a diamagnetic material.	05
Q.4B	The magnetic field in the interior of a certain solenoid has the value of 6.5×10^{-4} T when the solenoid is empty. When it is filled with iron, the field becomes 1.4 T. Find the relative permeability of iron.	05

Q.5A	Describe the process of solidification in terms of nucleation and growth of the crystals, crystallization and recrystallization.	05
Q.5B	Explain the degenerate and non-degenerate semiconductors with stating the applications of them.	05

Q.6A	What is meant by dielectric loss and explain the different types of dielectrics?	05
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Q.6B	At 0°C and 1 atmospheric pressure, the dielectric constant of helium is 1.000074 and its atomic density is 2.69×10^{25} atoms/m ³ . Determine the dipole moment induced in each Helium atom when the gas is placed in an electric field of strength 1 volt/m.	05
OR		
Q.6B	A solid elemental dielectric with 3×10^{28} atom /m ³ shows an electronic polarizability of 10^{-40} F-m ² . Assuming the internal electric field to be a Lorentz field, calculate the dielectric constant of the material.	05
Q.7A	Explain the term superconductivity. What is the effect of magnetic field on the superconductors? Explain briefly the properties of superconductors.	05
Q.7B	Lead in the superconducting state has critical temperature 6.2 K at zero magnetic field and a critical field 0.064 MA/m at 0 K. Calculate the critical field at 4 K.	05
OR		
Q.7B	A long super conductor wire produces a magnetic field of 200×10^3 A/m on its surface due to current through it at temperature T (<T _C). Its critical magnetic field at 0 K is 250×10^3 A/m. The critical temperature of the material of wire is 12 K. Find the value of T.	05
Q.8	Explain the phenomenon of piezo-electricity. How phenomenon of piezo-electricity can be used in different applications (at least 3 applications)?	10
Q.9A	Explain the origin of ferromagnetism and explain ferromagnetic hysteresis on the basis of Weiss theory of domains?	10
Q.9B	Explain the effect of temperature, alloying, and mechanical stress on the resistivity of the conducting materials. Describe any two applications of each low and high resistivity materials.	10
OR		
Q.9B	How are Printed Circuit Boards (PCBs) classified on the basis of their writing structure? Describe the process of cladding a PCB laminate with copper foil.	10

