

Enrollment No.....



Faculty of Engineering  
End Sem (Odd) Examination Dec-2019  
EE3ES09 / EX3ES09 Engineering Materials

Programme: B.Tech.

Branch/Specialisation: EE/EX

**Duration: 3 Hrs.****Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

- Q.1 i. Lattice points are known as 1  
 (a) Periodic arrangement of atom  
 (b) An array of points generated by translation operations  
 (c) Crystal structure  
 (d) Centre of atomic structure
- ii. The angular momentum of an electron is 1  
 (a)  $\frac{hf}{2\pi}$  (b)  $\frac{h^2 - h^2}{2\pi}$  (c)  $\frac{nh}{2\pi}$  (d)  $\frac{mvh}{2\pi}$
- iii. Electrical Conductivity  $\sigma$  is equal to 1  
 (a)  $2\rho$  (b)  $\rho$  (c)  $\frac{1}{\rho}$  (d)  $n\rho$
- iv. Ferroelectric materials have a 1  
 (a) High dielectric constant  
 (b) Low dielectric constant  
 (c) Medium dielectric constant  
 (d) Zero dielectric constant
- v. Which one is not Insulating material? 1  
 (a) SF<sub>6</sub> (b) Mica  
 (c) Polyvinyl chloride (d) Rolled steel
- vi. Which factor is considered for dielectrics characterization? 1  
 (a) Relative permittivity (b) Tangent of lag angle  
 (c) Dielectric Strength (d) All of these
- vii. Which material used to make N-type semiconductor 1  
 (a) Boron (b) Gallium (c) Indium (d) Arsenic

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- viii. At Curie point the temperature of iron magnetic material is **1**  
 (a) Greater than 760° C (b) Less than 760° C  
 (c) Equal to 760° C (d) None of these
- ix. Which material have high resistivity? **1**  
 (a) Platinum (b) Tungsten  
 (c) Molybdenum (d) All of these
- x. Which material is not type -II Super conductor material? **1**  
 (a) Al (b) Nb<sub>3</sub>Al (c) Nb<sub>3</sub>Sn (d) NbN
- Q.2 i. What is crystal lattice? Also define lattice points. **2**  
 ii. Describe briefly smart and Nano material. **3**  
 iii. Discuss the formation of energy bands in solids. In what respects these bands are different for insulators, conductors and semiconductors. **5**
- OR iv. Describe briefly the basic seven systems of crystals. **5**
- Q.3 i. What is the solubility limit? **2**  
 ii. Explain the term Recovery, Recrystallization, and Grain Growth with diagram. **8**
- OR iii. Discuss the properties and applications of ferrous and non – ferrous alloy. Also give the name of these alloys. **8**
- Q.4 i. Give the classification of composite materials. **3**  
 ii. Give the classification of polymers. Discuss the term polymerization, additives for polymer products. **7**
- OR iii. Why SF<sub>6</sub> used as a dielectric and insulating material. Give the specification of SF<sub>6</sub> gas for GIS applications. **7**
- Q.5 i. Discuss the intrinsic and extrinsic semiconductors. **4**  
 ii. What is electrical conductivity? Discuss the effect of temperature on conductivity. **6**
- OR iii. Give the classification of magnetic materials; also discuss the properties of magnetic materials. **6**

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- Q.6 Attempt any two: **5**
- i. Explain the photoconductivity and superconductivity. **5**  
 ii. Discuss the different microscopy methods for Materials Characterization. **5**  
 iii. Explain the behaviour of piezoelectric and optoelectric materials. **5**

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**Marking Scheme**  
**EE3ES09 / EX3ES09 Engineering Materials**

Q.1	i.	Lattice points are known as		<b>1</b>
		(b) An array of points generated by translation operations		
	ii.	The angular momentum of an electron is		<b>1</b>
		(c) $\frac{nh}{2\pi}$		
	iii.	Electrical Conductivity $\sigma$ is equal to		<b>1</b>
		(c) $\frac{1}{\rho}$		
	iv.	Ferroelectric materials have a		<b>1</b>
		(a) High dielectric constant		
	v.	Which one is not Insulating material?		<b>1</b>
		(d) Rolled steel		
	vi.	Which factor is considered for dielectrics characterization?		<b>1</b>
		(d) All of these		
	vii.	Which material used to make N-type semiconductor		<b>1</b>
		(d) Arsenic		
	viii.	At Curie point the temperature of iron magnetic material is		<b>1</b>
		(a) Greater than 760° C		
	ix.	Which material have high resistivity?		<b>1</b>
		(d) All of these		
	x.	Which material is not type -II Super conductor material?		<b>1</b>
		(a) Al		
Q.2	i.	Crystal lattice	1 mark	<b>2</b>
		Define lattice points	1 mark	
	ii.	Smart and Nano material.		<b>3</b>
	iii.	Formation of energy bands in solids	2 marks	<b>5</b>
		Different for insulators, conductors and semiconductors		
			3 marks	
OR	iv.	Basic seven systems of crystals		<b>5</b>
		Naming	2 marks	
		Definition	3 marks	
Q.3	i.	Definition of solubility limit		<b>2</b>
	ii.	Recovery	2 marks	<b>8</b>
		Recrystallization	2 marks	
		Grain Growth	2 marks	
		Diagram	2 marks	

OR	iii.	Properties and applications with name of these alloys		<b>8</b>
		Ferrous alloy	4 marks	
		Non –ferrous alloy	4 marks	
Q.4	i.	Classification of composite materials.		<b>3</b>
	ii.	Classification of polymers	3 marks	<b>7</b>
		Polymerization, additives for polymer products	4 marks	
OR	iii.	Reason for SF6 used as a dielectric and insulating material		<b>7</b>
			3 marks	
		Specification of SF6 gas for GIS applications.	4 marks	
Q.5	i.	Intrinsic semiconductors	2 marks	<b>4</b>
		Extrinsic semiconductors	2 marks	
	ii.	Electrical conductivity	3 marks	<b>6</b>
OR		Effect of temperature on conductivity	3 marks	
	iii.	Classification of magnetic materials	3 marks	<b>6</b>
		Properties of magnetic materials	3 marks	
Q.6		Attempt any two:		<b>5</b>
	i.	Photoconductivity	2.5 marks	
		Superconductivity	2.5 marks	
	ii.	Different microscopy methods for Materials Characterization		
		Naming	2 marks	
		Definition	3 marks	
	iii.	Behaviour of piezoelectric	2.5 marks	<b>5</b>
		Behaviour of optoelectric materials	2.5 marks	

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