JUNE 2010

AMIETE - ET (OLD SCHEME)

Code: AE04 Time: 3 Hours				Subjec	Subject: MATERIALS AND PROCESSES Max. Marks: 100		
• Qu wi no • Ou qu	uesti ritte whe ut of iestic	on 1 in tere else the i	he space provided for se. remaining EIGHT Q rries 16 marks.	rries 20 r r it in the questions	narks. Answer to Q.1 answer book supplie answer any FIVE Qu ay be suitably assume	d and lestions. Each	
Q.1	Choose the correct or the best alte			lternative i	native in the following: (2×10)		
	a.	Which one of the following material is Piezoelectric?					
		(A) (C)	Pb ₂ Au MgAl ₂ O ₄		(B) BaTiO 3 (D) NiFe 2O4		
	b.						
		, ,	Less than zero Greater than one		(B) Less than one by (D) Equals to zero	ut positive	
	c.	A so	emiconductor is electr	ically neu	tral because		
			No majority carriers No free carriers ers		(B) No minority carr (D) Equal positive &		
	d. The electrostatic nature of ionic bond makes it						
		(B) (C)	Directional Non-directional Weak Applicable to group I	V elemen	ts.		

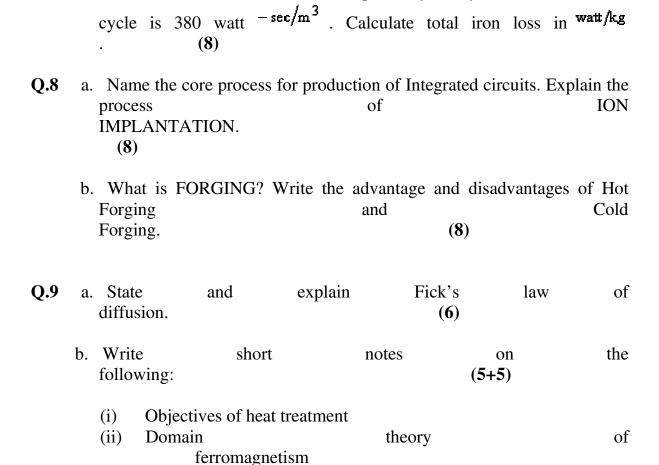
e. The miller indices are same for

		(A) Perpendicular planes(C) Parallel planes	(B) Crystal planes(D) Three crystallographic axes					
	f.	The relaxation times (τ) in a perfe	ect dielectric is					
		$(A) \propto (C) 1 < \tau < \infty$	(B) 1 (D) 0					
	g.	g. For small size, high frequency coils, the most common core material is						
		(A) Powdered iron(C) Ferrite	(B) Air (D) Steel					
	h. Magnetic recording tape is most commonly made from							
		(A) Ferric oxide(C) Small particles of iron	(B) Silicon iron(D) Alnico					
	i.	i. Solder is an alloy of						
		(A) Copper and aluminium(C) Tin and Lead	(B) Nickel, Copper and Zinc(D) Silver, Copper and Lead					
	j.	. Which of the following material is the best conductor of electricity?						
		(A) Aluminium(C) Tungsten	(B) Carbon(D) Copper					
Answer any FIVE Questions out of EIGHT Questions. Each question carries 16 marks.								
Q.2	a.	• 1	c bonds observed in solid materials? of them with suitable (8)					
	b. What is atomic packing factor? Find the atomic packing factor for BCC and FCC structures.(8)							
Q.3	a.	What is point imperfect defects. (8)	ion? Discuss various point					
	b.	State and explain Gibb's importance? (8)	phase rule. What is its					

- Q.4 a. Calculate the mobility and average time of collision of the electrons in copper. If the density of copper is 8.94 gm/ cm³, the resistivity is $1.73 \times 10^{-8} \Omega$ m and the atomic weight is 63.5. (8)
 - b. Give the chemical composition, properties and uses of Nichrome, Manganin and Constantan.(8)
- Q.5 a. A potential difference of 2V is applied across the faces of a small germanium plate of area 1 cm², and of thickness 0.3 mm. Given, the concentration of free electrons in germanium is 2×10¹⁹/m³, mobilities of electron and holes are 0.36 m²/V-sec and 0.17 m²/V-sec respectively. Calculate the value of current produced.

 (8)
 - b. What is Hall effect? Derive the relation for Hall Voltage, charge density and mobility by assuming the presence of only one type of charge carrier.

 (8)
- Q.6 a. What is piezoelectric effect? How is Quartz used for generating ultrasonic waves? Also write some uses of piezoelectric crystal.
 (8)
 - b. Write the properties and uses of mica, bakelite and polyvinyl chloride as insulating materials.
- Q.7 a. Differentiate between soft and hard magnetic materials with suitable examples and B-H plots. (8)
 - b. Calculate eddy current loss in w/kg in a specimen of alloy steel for maximum flux density of 1.1 wb/m² and frequency of 50 Hz, using 0.5 mm thick sheets. Take density and resistivity of alloy steel as



 7800 kg/m^3 and $30 \times 10^{-8} \Omega \text{m}$ respectively. If hysteresis loss in each