Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem (Even) Examination May-2018

ME2CO08 Engineering Materials and Processes

Programme: Diploma Branch/Specialisation: ME

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. Which hardness method can measure hardness of a grain? **1**

(a) Knoop (b) Shore (c) Rockwell (d) Vickers

ii. Insulating material commonly used in spark plug is **1**

(a) Rubber (b) Porcelain (c) Mica (d) Polysterene

iii. Zinc has hcp structure. In a unit cell of zinc, the zinc atoms occupy **1**

(a) 74% of volume of unit cell.

(b) 80% of volume of unit cell.

(c) 68% of volume of unit cell.

(d) 90% of volume of unit cell.

iv. Miller indices of the diagonal plane of a cube are **1**

(a) (200) (b) (111) (c) (000) (d) (110)

v. What is equation of Gibb's Phase rule? **1**

(a) F= C+n+P (b) F= C-n-P (c) F= C+n-P (d) F= P+n-C

vi. On heating, if one solid phase splits into two solid phases, the reaction is **1**

(a) Eutectoid (b) Eutectic (c) Peritectic (d) Peritectoid

vii. In which of the following phases of steel cementite is in lamellar form **1**

(a) Ferrite (b) Bainite (c) Martensite (d) Pearlite

viii. Pearlite is a mixture of **1**

(a) Ferrite + Austenite (b) Ferrite+ Cementite

(c) Ferrite + Ledeburite (d) Cementite + Austenite

P.T.O.

	ix.	Fine grain sizes are obtained by (a) Slow cooling. (b) Increasing nucleation rate. (c) Decreasing growth rate (d) Fast cooling.	**1**
	x.	Hardenability of steel is assessed by (a) Impact test (b) Hardness test (c) Compression test (d) Jominy end quench test	**1**
Q.2	i.	Define Ductility and Hardness.	**2**
	ii.	Draw stress - strain diagram for a ductile material. Discuss the salient features of the curve.	**3**
	iii.	What do you understand by Destructive and non Destructive testing? Explain Impact testing of metals.	**5**
OR	iv.	Give a detailed classification of engineering materials. State the difference between Steel and Cast Iron.	**5**
Q.3	i.	Define crystal imperfection. Classify the various types of imperfections found in crystals.	**3**
	ii.	What is a unit cell? Discuss the SC, BCC, FCC and HCP types of unit cells with the help of sketches. Calculate effective number of atoms in each case.	**7**
OR	iii.	Iron has an atomic radius of 0.125 mm with BCC crystal structure. If the atomic weight of iron is 55.8 g/mol, calculate its density.	**7**
Q.4	i.	What is Phase? Explain Gibb's phase rule. What is its utility?	**3**
	ii.	What is a TTT diagram? Draw a neat TTT diagram for eutectoid steel and explain how it is constructed?	**7**
OR	iii.	What are phase diagrams? Draw a neatly labelled phase diagram for a Binary Isomorphous system.	**7**
Q.5	i.	Write a short note on allotropy of pure iron with a neat diagram.	**4**
	ii.	Draw the Iron Carbon equilibrium diagram. Indicate various phases on it.	**6**
OR	iii.	Write short note on: (a) Martensite (b) Bainite (c) Sorbite (d) Troostite (e) Spheroidite (f) Ferrite	**6**

Q.6		Attempt any two:	
	i.	Define the term Heat Treatment and state its objectives. Discuss the major defects in steel due to faulty heat treatment.	**5**
	ii.	What is soaking time in Heat Treatment? Write short note on (a) Annealing and its types (b) Normalizing and its applications.	**5**
	iii.	Define Surface Hardening. Explain the process with neat diagrams: (a) Induction hardening (b) Flame hardening	**5**

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Marking Scheme
ME2CO08 Engineering Materials and Processes

Q.1	i.	Which hardness method can measure hardness of a grain? (a) Knoop		**1**
	ii.	Insulating material commonly used in spark plug is (b) Porcelain		**1**
	iii.	Zinc has hcp structure. In a unit cell of zinc, the zinc atoms occupy (a) 74% of volume of unit cell.		**1**
	iv.	Miller indices of the diagonal plane of a cube are (d) (110)		**1**
	v.	What is equation of Gibb's Phase rule? (c) F= C+n-P		**1**
	vi.	On heating, if one solid phase splits into two solid phases, the reaction is (d) Peritectoid		**1**
	vii.	In which of the following phases of steel cementite is in lamellar form (d) Pearlite		**1**
	viii.	Pearlite is a mixture of (b) Ferrite+ Cementite		**1**
	ix.	Fine grain sizes are obtained by (d) Fast cooling.		**1**
	x.	Hardenability of steel is assessed by (d) Jominy end quench test		**1**
Q.2	i.	Definition Ductility	1 mark	**2**
		Hardness	1 mark	
	ii.	Stress - strain diagram	1 mark	**3**
		Salient features of the curve	2 marks	
	iii.	Destructive and non Destructive testing	2 marks	**5**
		Impact testing of metals.	3 marks	
OR	iv.	Classification of engineering materials	3 marks	**5**
		Difference between Steel and Cast Iron.	2 marks	
Q.3	i.	Crystal imperfection	1 mark	**3**
		Types of imperfections found in crystals	2 marks	
	ii.	Unit cell	1 mark	**7**
		SC, BCC, FCC and HCP types of unit cells	4 marks	
		Calculate effective number of atoms	2 marks	
OR	iii.	Iron has an atomic radius of 0.125 mm with BCC crystal structure. If the atomic weight of iron is 55.8 g/mol, calculate its density.		**7**
Q.4	i.	Phase	1 mark	**3**
		Gibb's phase rule	1 mark	
		Its utility	1 mark	
	ii.	TTT diagram	2 marks	**7**
		TTT diagram for eutectoid steel	3 marks	
		Its Construction	2 marks	
OR	iii.	Phase diagrams	2 marks	**7**
		Phase diagram for a Binary Isomorphous system	5 marks	
Q.5	i.	Allotropy of pure iron	2 marks	**4**
		Diagram	2 marks	
	ii.	Iron Carbon equilibrium diagram	4 marks	**6**
		Various phases	2 marks	
OR	iii.	Write short note on: 1 mark for each	(1 mark * 6)	**6**
		(a) Martensite (b) Bainite (c) Sorbite (d) Troostite (e) Spheroidite (f) Ferrite		
Q.6		Attempt any two:		
	i.	Heat Treatment	1 mark	**5**
		Its objectives	2 marks	
		Defects in steel due to faulty heat treatment	2 marks	
	ii.	Soaking time in Heat Treatment	1 mark	**5**
		(a) Annealing and its types	2 marks	
		(b) Normalizing and its applications	2 marks	
	iii.	Surface Hardening	1 mark	**5**
		(a) Induction hardening	2 marks	
		(b) Flame hardening	2 marks	

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