DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

End Semester Examination – Winter 2018

Course: B. Tech. in Mechanical Engineering **Semester:** III

Subject Name: Materials Science and Metallurgy **Subject Code:** BTMEC 302

Date:03/12/2018 **Marks: 60** **Duration: 3 Hrs.**

Instructions to the Students:

1. *Solve **ANY FIVE** questions out of the following.*
2. *The level question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
3. *Use of non-programmable scientific calculators is permitted.*
4. *Assume suitable data wherever necessary and mention it clearly.*

		(Level/CO)	*Marks*
Q. 1	**Solve the following.**		**12**
A)	Derive the expressions for planar atomic densities on (100), (110), and (111) planes of both BCC and FCC crystal structures.	***(Understand, CO1)***	
B)	Explain slip mechanism of plastic deformation w.r.t. conceptual meaning, its occurrence due to the movement of edge and screw dislocations, and comparison with twinning.	***(Understand)***	
Q.2	**Solve the following.**		**12**
A)	A tension test was conducted on steel specimen of diameter 12.5 mm and gauge length 50 mm. The loads at lower and upper yield points were recorded to be 45000 and 46000 N respectively. The maximum and fracture loads were 75000 and 50000N respectively. The gauge length after fracture was 62.5 mm. The diameter at fracture was found to be 8 mm. At a load of 20000 N, the total extension was 0.035 mm. Determine the following: (i) Lower yield stress (ii) Ultimate tensile stress (iii) True fracture stress (iv) Percentage elongation (v) Percentage reduction in area (vi) Modulus of resilience.	***(Apply, CO 2)***	
B)	Discuss Vickers Hardness Test w.r.t principle of working, indenter details, formula, advantages, and limitations.	***(Understand)***	
Q. 3	**Solve the following.**		**12**
A)	Describe the types of solid solutions. Explain Hume-Rothery's rules of solid solubility.	***(Remember)***	
B)	What is the importance of T-T-T diagrams? Explain the procedure to determine these diagrams with the help of schematic diagrams.	***(Understand)***	
Q.4	**Solve *Any Two* of the following.**		**12**

A) Define heat treatment and give its objectives. Give the names of two different heat treatment processes along with the major objective of each. *(Understand)*

B) Explain tempering process w.r.t. purposes, process details, types, and variation of properties with tempering temperature. *(Understand)*

C) Discuss induction hardening process w.r.t. principle of working, process details, advantages, and limitations. *(Understand)*

Q. 5 Solve *Any Two* of the following. **12**

A) Describe the procedure of specimen preparation for microscopy. *(Understand)*

B) Explain the principle of working of optical metallurgical microscope. Compare it with electron microscope. *(Remember)*

C) Discuss sulphur print test w.r.t. purpose, significance, procedure, and chemical reactions. *(Understand)*

Q. 6 Solve the following. **12**

A) Explain dispersion strengthening w.r.t. basic mechanism, critical factors, advantage, and commercial examples. *(Remember)*

B) Describe ultrasonic inspection technique w.r.t. principle of working, types, and applications. *(Understand)*

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