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Code No. : 13515

VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD
B.E. (Mech. Engg.: CBCS) III-Semester Main Examinations, December-2018

Metallurgy and Material Science

Time: 3 hours

Max. Marks: 60

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Q. No	Stem of the Question	M	L	CO	PO
Part-A (10 × 2 = 20 Marks)					
1.	Show Schottky and Frenkel defects in crystals by means of a sketch.	2	1	1	1
2.	What do you mean by Bauschinger effect?	2	1	1	1
3.	Explain cumulative fatigue.	2	2	2	1
4.	List the applications of diffusion in Mechanical Engineering.	2	1	2	1
5.	Explain Lever rule in phase diagrams.	2	2	3	2
6.	Illustrate the cooling curve for pure iron and mention the allotropic transformations at different temperatures.	2	2	3	2
7.	What are the advantages of nitriding over carburizing?	2	1	4	2
8.	Outline the various characteristics of martensite transformation.	2	2	4	2
9.	What is maraging steel?	2	1	5	2
10.	What features of metal powders are important for the manufacturing of powder metallurgy products? List the four basic steps usually involved in making products by powder metallurgy.	2	1	5	1
Part-B (5 × 8 = 40 Marks)					
11. a)	Explain Griffith theory for brittle fracture. Develop the formula for average applied stress at which crack spreads.	5	3	2	1
b)	Contrast hot working and cold working processes.	3	2	1	1
12. a)	Analyze different stages of creep curve.	4	4	2	1
b)	Analyze SN curve for ferrous and nonferrous materials.	4	4	2	1
13. a)	Discuss different possible types of phase diagrams in binary alloys.	4	2	3	2
b)	Explain the cooling process of 1.2% carbon steel along with the phase transformation when cooled from austenite phase to room temperature.	4	5	3	2
14. a)	Analyze pearlite transformation and Bainite transformation with reference to TTT diagram.	4	4	4	2
b)	Compare flame hardening with induction hardening.	4	2	4	2
15. a)	Summarize the construction and working of an Electric Arc furnace.	5	2	5	1
b)	Explain the classification, properties and applications of stainless steels.	3	2	4	1
16. a)	Survey the recovery, recrystallization and grain growth and its effect on mechanical properties of metals.	4	4	1	1
b)	Examine the effect of metallurgical variables on fatigue of metals.	4	4	2	1

Contd... 2

17. Answer any <i>two</i> of the following:				
a) Interpret plain carbon steels-types, properties and applications	4	2	3	2
b) Normalizing is a better process compared to annealing. Justify.	4	5	4	2
c) Summarize composite materials-types and applications.	4	2	5	1

M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PO: Programme Outcome

S. No.	Criteria for questions	Percentage
1	Fundamental knowledge (Level-1 & 2)	59
2	Knowledge on application and analysis (Level-3 & 4)	31
3	*Critical thinking and ability to design (Level-5 & 6) (*wherever applicable)	10

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