PAPER ID-411912

Roll No:

BTECH
(SEM III) THEORY EXAMINATION 2021-22
MATERIALS ENGINEERING

Time: 3 Hours   *Total Marks: 100*

Note: **1.** Attempt all Sections. If require any missing data; then assume suitably.

SECTION A

1.   **Attempt *all* questions in brief.**   **2 x 10 = 20**

Qno.	Question	Marks	CO
a.	Define unit cell in a crystal structure.	2	1
b.	Differentiate between ductility and malleability.	2	2
c.	Explain Stress intensity factor.	2	2
d.	Draw the plane having miller indices (011) and (001).	2	1
e.	Explain Gibbs Phase rule.	2	3
f.	Discuss the use of Phase diagram.	2	3
g.	Define critical cooling rate.	2	4
h.	Explain why tempering is required after hardening.	2	4
i.	Differentiate between brass and bronze.	2	5
j.	Describe super alloy and give its one example.	2	5

SECTION B

2.   **Attempt any *three* of the following:**   **3 x 10 = 30**

Qno.	Question	Marks	CO
a.	Classify the defect in crystal and explain point defect in detail with neat sketch.	10	1
b.	Discuss following theories of failure in brief: (1) Maximum principal stress theory (2) Maximum shear stress Theory (3) Maximum distortion energy theory.	10	2
c.	Differentiate between alloy and solid solution. Also explain the Hume-Ruthery rule for solid solubility in solid solution.	10	3
d.	Explain the heat treatment and its objective. Also discuss the full annealing, normalizing and hardening process with help of Fe-C diagram.	10	4
e.	Describe cast iron and discuss composition and application of Grey cast iron, malleable cast iron, white cast iron and spheroidal cast iron.	10	5

SECTION C

3.   **Attempt any *one* part of the following:**   **1 x 10 = 10**

Qno.	Question	Marks	CO
a.	Discuss the stress strain curve for steel and explain why steel is having two yield points. Also establish relation between the true stress and engineering stress.	10	1
b.	A component having length of 1m was loaded beyond elastic limit. At a point when its length increased by 3mm. It was experiencing stress of 250MPa. If the young's modulus of the material is 200GPa.What will be the final dimension of the component after unloading.	10	1

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4. **Attempt any *one* part of the following:** **1 x 10 = 10**

Qno.	Question	Marks	CO
a.	Explain Griffith theory for brittle fracture and formulate the expression for critical crack size.	10	2
b.	Discuss the fatigue failure and method of developing S-N curve for steel using RR Moore test.	10	2

5. **Attempt any *one* part of the following:** **1 x 10 = 10**

Qno.	Question	Marks	CO
a.	Draw and explain the iron carbon diagram and show all invariant reaction and phases in it.	10	3
b.	In lead tin system the eutectic reaction take place at a temperature 183°C at 61.9% tin. T eutectic temperature the solubility of tin in α phase is 19.2% and solubility of tin in β phase is 97.5%. The melting point of lead and tin is 327°C and 232°C respectively. The solubility of tin in α phase at room temperature is zero and solubility of lead in β phase at room temperature is zero. Draw the Phase diagram and determine fraction of α and β phase at eutectic point.	10	3

6. **Attempt any *one* part of the following:** **1 x 10 = 10**

Qno.	Question	Marks	CO
a.	Explain surface hardening of steel. Discuss any two method of surface hardening with neat sketch.	10	4
b.	Explain the method of developing TTT curve. Draw the TTT diagram for eutectic steel and show transformation of austenite to perlite, bainite and martensite.	10	4

7. **Attempt any *one* part of the following:** **1 x 10 = 10**

Qno.	Question	Marks	CO
a.	Discuss the need of alloying of steel and also discuss the effect of different alloying element on properties of steel.	10	5
b.	Discuss the composition and application of following alloys (i)Monel Metal (ii) Muntz Metal (iii) Gun metal (iv) Duralumin (v) Y-alloy	10	5