Subject Code: KME303

PAPER ID-312074

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM III) THEORY EXAMINATION 2024-25
MATERIALS ENGINEERING

TIME: 3 HRS **M.MARKS: 100**

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

SECTION A

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

Q no.	Question	CO	Level
a.	What do you mean by amorphous materials?	1	K2
b.	Differentiate between toughness and resilience.	1	K2
c.	Define fatigue life.	2	K2
d.	Write down the factors on which stress intensity factor depends.	2	K2
e.	What is the use of lever rule?	3	K2
f.	Write down the significance of iron-carbon equilibrium diagram.	3	K2
g.	What do you mean by carburizing?	4	K2
h.	Why hardening is followed by tempering?	4	K2
i.	What are the different types of stainless steel?	5	K2
j.	Why chromium is added into the alloys?	5	K2

SECTION B

2. Attempt any *three* of the following:

Q no.	Question	CO	Level
a.	What is a dislocation? What are different types of dislocation? Explain and draw their neat sketches and mark burger vector in each case.	1	K2
b.	Discuss the mechanism of ductile fracture with neat sketch. Also differentiate between brittle and ductile fracture.	2	K2
c.	Explain with neat sketches the substitutional solid solution and interstitial solid solution. Define the Hume-Rothery's rule for solid solution.	3	K2
d.	Describe hardening process in detail. Name various types of case hardening processes and explain in detail nitriding process with its merits and demerits.	4	K2
e.	What are the purposes of alloying elements of steel? Discuss effects of different alloying elements on the properties of steel.	5	K2

SECTION C

3. Attempt any *one* part of the following:

Q no.	Question	CO	Level
a.	Describe the FCC crystal structure. Derive the relation between edge length and radius of FCC crystal structure. Also obtain an expression for the packing factor of FCC.	1	K3
b.	What are ceramic materials? Discuss about various ceramic crystal structures.	1	K2

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4. Attempt any *one* part of the following:

Q no.	Question	CO	Level
a.	Explain the statement of Rankine's and Tresca's theory. Derive Expression and draw graph for both theories.	2	K3
b.	What is non destructive testing (NDT)? Explain the various non-destructive testing methods in details.	2	K2

5. Attempt any *one* part of the following:

Q no.	Question	CO	Level
a.	Explain Iron-Carbon (Fe-C) equilibrium diagram with neat sketch. Briefly explain the various reactions and phases present in the diagram.	3	K2
b.	What is binary phase diagram? Discuss the isomorphous and eutectic phase diagrams with neat sketches.	3	K2

6. Attempt any *one* part of the following:

Q no.	Question	CO	Level
a.	What do you understand by heat treatment? What are its purposes? Define annealing and normalizing processes in details.	4	K2
b.	Draw and explain the TTT diagram for eutectoid steel with suitable diagram. Explain important transformations taking place in it on cooling.	4	K2

7. Attempt any *one* part of the following:

Q no.	Question	CO	Level
a.	What is cast iron? Explain the various types of cast iron also describe its properties and uses.	5	K2
b.	Discuss about some aluminium alloys and their compositions. Why aluminium alloys are so important in modern engineering practices? Justify your answer with suitable example	5	K2