Printed Page:-04

Subject Code ROBOX6	
Subject Coue DOL0302	,

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: III - THEORY EXAMINATION (2024- 2025)

Subject: Engineering Science and Courses

Time: 3 Hours

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of three Sections -A, B, & C. It consists of Multiple Choice

Questions (MCQ's) & Subjective type questions.

2. Maximum marks for each question are indicated on right -hand side of each question.

3. Illustrate your answers with neat sketches wherever necessary.

4. Assume suitable data if necessary.

5. Preferably, write the answers in sequential order.

6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A

1. Attempt all parts:-

- 1-a. Which material typically exhibits a linear elastic region followed by a significant 1 plastic deformation region in its stress-strain curve? [CO1, K1]
 - (a) Ceramic
 - (b) Metal
 - (c) Polymer
 - (d) Composite
- 1-b. What is a solid solution where the solute atoms occupy substitutional lattice sites 1 in the solvent lattice? [CO1, K1]
 - (a) Interstitial solid solution
 - (b) Substitutional solid solution
 - (c) Intermetallic compound
 - (d) Eutectic mixture
- 1-c. Tempering is a process used to: [CO2, K1]
 - (a) Increase hardness
 - (b) Reduce brittleness
 - (c) Improve machinability
 - (d) All of the above
- 1-d. Which factor affects the rate of diffusion? [CO2, K1]
 - (a) Temperature

Max. Marks: 100

20

1

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	(b)	Concentration gradient			
	(c)	Type of material			
	(d)	All of the above			
1-e.	Sl	Shape memory alloys exhibit: [CO3, K1]			
	(a)	Superconductivity			
	(b)	Shape memory effect			
	(c)	Ferromagnetism			
	(d)	Piezoelectricity			
1-f.	Which of the following is a type of chromic material?[CO3, K1]				
	(a)	Shape memory alloy			
	(b)	Photochromic material			
	(c)	Piezoelectric material			
	(d)	Magnetostrictive material			
1-g.	Pa	article-reinforced composites are characterized by: [CO4, K1]	1		
	(a)	Continuous fibers			
	(b)	Discontinuous fibers			
	(c)	Dispersed particles			
	(d)	A matrix material only			
1 - h.	W	which of the following is a disadvantage of using composite materials? [CO4, K1]	1		
	(a)	High cost			
	(b)	Complex manufacturing processes			
	(c)	Potential for damage during fabrication			
	(d)	All of the above			
1-i.	So	canning tunneling microscopy (STM) is used to: [CO5, K1]	1		
	(a)	Image surfaces at the atomic level			
	(b)	Measure thermal conductivity			
	(c)	Determine magnetic properties			
	(d)	Analyze crystal structure			
1-j.	Which NDT technique is based on the principle of electromagnetic induction? [CO5, K1]				
	(a)	Ultrasonic testing			
	(b)	Magnetic particle testing			
	(c)	Eddy current testing			
	(d)	Radiographic testing			
2. Att	empt a	all parts:-			
2.a.	W	hat is the fatigue limit of a material? Explain S-N curve. How does it affect the	2		
	de	esign of engineering components? [CO1, K2]			
2.b.	W	hat is interstitial diffusion?[CO2, K1]	2		

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2.c.	Explain the concept of photochromism. [CO3, K1]	2
2.d.	How can the performance of composite materials be improved through the use of nanotechnology?[CO4, K2]	2
2.e.	What is the principle of eddy current testing?[CO5, K1]	2
<u>SECTI</u>	<u>ON-B</u>	30
3. Ansv	ver any <u>five</u> of the following:-	
3-а.	Discuss the iron-carbon phase diagram in detail, highlighting the important phases and phase transformations. [CO1, K3]	б
3-b.	What is creep failure? Also Explain the different stages of creep failure.[CO1, K2]	6
3-с.	Explain the principle of carburizing and nitriding processes. Also write down the limitations of carburizing and nitriding. [CO2, K2]	6
3-d.	What is a TTT diagram? Explain with the help of neat sketch. [CO2, K2]	6
3.e.	Discuss the factors affecting the electrical conductivity of semiconductors. [CO3, K2]	6
3.f.	Explain the role of computational modeling in the design and analysis of composite structures. [CO4, K2]	6
3.g.	Explain the working principle of a transmission electron microscope. [CO5, K2]	6
<u>SECTI</u>	<u>ON-C</u>	50
4. Ansv	ver any <u>one</u> of the following:-	
4-a.	Explain how the liquid penetrant test be used to detect surface discontinuities? Explain the various stages of liquid penetrant testing procedure. [CO1, K3]	10
4-b.	With neat sketch explain the Working Principle of ultrasonic Testing. [CO1, K2]	10
5. Ansv	ver any <u>one</u> of the following:-	
5-a.	Explain the mechanism of diffusion process. Also Compare and contrast diffusion in solids and liquids.[CO2 K3]	10
5-b.	Explain the following heat treatment processes with help of neat sketch and also write down their advantages and limitations 1. Normalising 2. Quenching[[CO2 K3]	10
6. Ansv	ver any <u>one</u> of the following:-	
6-a.	Describe the emerging trends in the field of biomaterials and their potential applications in regenerative medicine. [CO3, K2]	10
6-b.	Explain the concept of multifunctional materials and their potential applications. [CO3, K2]	10
7. Ansv	ver any <u>one</u> of the following:-	
7-a.	Discuss the challenges and future trends in the development of advanced composite materials. [CO4, K2]	10

Page 3 of 4

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7-b.	What do you understand by reinforcement materials. Explain fibre reinforced composite materials with their industrial applications. [CO4, K2]	10
8. Answe	r any <u>one</u> of the following:-	
8-a.	Explain the working principle of a scanning tunneling microscope. [CO5, K2]	10
8-b.	Explain the working principle of a differential scanning calorimeter.[CO5, K2]	10

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