USN

FIRST Semester B. E. Degree Semester End Examination (SEE), Jan/ Feb 2024

## **Physics of Materials**

(Model Question Paper - 1)					
[Time: 3 Hours]		[Maximum Marks: 100]			
	Instructions to students:				
	i. Answer FIVE FULL Questions as per choice.				
	ii. Use BLACK ball point pen for text, figure, table, etc.				
	iii. Assume missing data, if any.				
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		Module-1	Marks	CO1	RBT Level	
1.	a)	Obtain the differential equation for simple Harmonic Motion using Hooke's Law and mention any two applications of SHM	[08 Marks]	CO1	L2	
	b)	With neat diagram, explain the construction and working of Reddy 's shock tube.	[07 Marks]	CO1	L2	
	c)	The distance between two pressure sensors in shock tube is 100 mm, the time taken by a shock wave to travel this distance is $200\mu s$ , If the velocity of sound under the same conditions is $340m/s$ , Find the Mach number of the shock wave <b>OR</b>	[05 Marks]	CO1	L3	
2.	a)	Define damped vibrations. Obtain expressions for the amplitude and phase of damped vibrations.	[08 Marks]	CO1	L2	
	b)	What are shock waves? Mention the characteristics and applications of shock waves	[07 Marks]	CO1	L1	
	C)	A free particle is executing simple harmonic motion in a straight line with a period of 25seconds: 5 seconds after it has crossed the equilibrium point the velocity is found to be 0.7m/s. Find the displacement at the end of 10 seconds and also amplitude of oscillations.	[05 Marks]	CO1	L3	
Module-2						
3.	a)	Define Neutral plane, Obtain an expression for the moment of a bar with rectangular cross section.	[08 Marks]	CO1	L1	
	b)	Derive the relation between Y n and $\sigma$ and hence derive the relations between K n & Y, Given K= Y/2(1-2 $\sigma$ ).	[07 Marks]	CO1	L2	
	c)	Calculate the extension produced in a wire of length 2m and radius 0.013X10-2m due to force of 14.7 Newton applied to it6s length.( given $Y=2X10^{11}N/m^2$ ).	[05 Marks]	CO1	L3	
		OR				
4.	a)	Define Young s modulus of materials. Derive an expression for the youngs modulus of a beam using single cantilever.	[08 Marks]	CO1	L1	
	b)	State and explain HOOKS law. Define elastic limits, plastic limits ,strain softening and strain hardening.	[07 Marks]	CO1	L2	
	c)	Calculate the force required to produce an extension of 1mm in steel wire of length 2 meters and diameter 1mm.( given $Y=2X10^{11}N/m^2$ )	[05 Marks]	CO1	L3	

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5.	a)	What is the hall effect? Obtain the expression for hall coefficient, and express hall voltage	[08 Marks]	CO2	L2			
	b)	in terms of Hall coefficient Describe the successes of quantum free electron theory.	[07 Marks]	CO2	L2			
	c)	c) Calculate the probability of an electron occupying an energy level 0.02eV above the Fermi level at 200k and 400k.	[05 Marks]	CO2	L3			
		OR						
6.	a)	What is Fermi factor and explain the variation of Fermi factor with respect to temperature and energy.	[08 Marks]	CO2	L2			
	b)	Mention the expression of hole and electron concentration in a intrinsic semiconductor and derive the expression for Electrical conductivity of a semiconductor.	[07 Marks]	CO2	L1			
	c)	The Hall coefficient of a material is $-3.68 \times 10^{-5}$ m <sup>3</sup> /C. What is the type of charge carriers? Also calculate the carrier concentration.	[05 Marks]	CO2	L3			
	Module-4							
7.	a)	Define Liquefaction of gases. Describe Liquefaction of gases by cascade process	[08 Marks]	CO3	L1			
	b)	With neat diagram, explain the construction and working of Platinum resistance thermometer. Mention its advantages and disadvantages.	[07 Marks]	CO3	L2			
	c)	In Joule Thomson experiments Temperature changes from 100 <sup>o</sup> d to 150 <sup>o</sup> C for pressure change of 20 MPa to 170MPa . calculate Joule Thomson co-efficient.	[05 Marks]	CO3	L3			
8.	a)	<b>OR</b> Define Liquefaction of gases. Describe Liquefaction of oxygen gases by cascade process.	[08 Marks]	CO3	L1			
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	b)	State Joule Thomson effect and Describe its theory with derivation of three cases.	[07 Marks]	003	L2			
	c)	A bubble of air is underwater at temperature $1.5^{\circ}$ C and the pressure $1.5bar$ . If the bubble rises to the surface where the temperature is $25^{\circ}$ C and the pressure is $1.0bar$ , Calculate the volume of the bubble?	[05 Marks]	CO3	L3			
Module-5								
9.	a)	Explain construction and working of SEM	[08 Marks]	CO4	L2			
	b)	Mention any three properties and any four applications of carbon nano tubes.	[07 Marks]	CO4	L2			
	c)	Explain experimental determination of young's modulus of the given materials by single cantilever method.	[05 Marks]	CO5	L3			
OR								
10.	a)	Explain construction and working of TEM	[08 Marks]	CO4	L2			
	b)	Describe classification composite materials based on reinforcement materials and matrix.	[07 Marks]	CO4	L2			
	c)	Explain experimental determination wavelength of laser source using grating method.	[05 Marks]	CO5	L3			

Module-3

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