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Course Code

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Second Semester B.E. Degree Examinations, July 2026
PHYSICS FOR MECHANICAL ENGINEERING STREAM
(Mechanical Engineering)

Duration: 3 hrs

Max. Marks: 100

Note: 1. Answer any FIVE full questions choosing ONE Full Question from each Module
 2. Formula Handbook is permitted
 3. Missing data, if any, may be suitably assumed

<u>Q. No</u>	<u>Question</u>	<u>Marks</u>	<u>(RBTL:CO:PO)</u>
<u>Module-1</u>			
1.	a. Define SHM and mention any two examples. Obtain differential equation of motion for SHM.	08	(3 : 1: 1.1.1)
	b. Find the effective spring constant in case of spring connected in series and parallel combination.	08	(3 : 1 1.1.1)
	c. A man weighing 600 N steps on a spring scale machine. The spring in the machine compressed by 1 cm. Find the force constant of the spring.	04	(3 : 1:2.1.3)
(OR)			
2.	a. What are damped oscillations? Obtain a differential equation for a body undergoing damped oscillations.	08	(3 : 1:1.1.1)
	b. What are forced oscillations? Obtain expression for displacement of forced oscillations.	08	(1 : 1:1.1.1)
	c. Evaluate the resonance frequency of a spring of force constant 1974 N/m, carrying of mass of 2 Kg.	04	(3: 1 :2.1.3)
<u>Module-2</u>			
3.	a. Define Young's modulus, Bulk modulus, Rigidity of modulus & Poisson's ratio. Discuss the limiting values of Poisson's ratio	08	(3 : 2:1.1.1)
	b. State Hooke's law. Briefly explain stress-strain curve.	08	(2 : 2:1.1.1)
	c. A wire 2 m long and 2 mm in diameter, when stretched by weight of 8 Kg has its length increased by 0.24 mm. Find the stress, strain and Young's modulus of the material of the wire. Given $g = 9.8 \text{ m/s}^2$.	04	(3 : 2:2.1.3)
(OR)			
4.	a. Derive the relation between Young's modulus (Y), rigidity modulus (n) and Poisson's ratio (σ).	08	(2 : 2:1.2.1)
	b. Derive an expression for Young's modulus of a rectangular material of a single cantilever beam.	08	(3 : 2:1.1.1)
	c. A metal wire of 1 m long and 2 mm diameter is stretched by a load of 40 Kg. If $Y = 7 \times 10^{10} \text{ N/m}^2$ for the metal, Find stress, strain and force constant.	04	(3 : 2:2.1.3)

Module-3

5. a. Discuss Seebeck effect and Peltier effect with their coefficients. 08 (1 : 3:1.1.1)
- b. What is thermoelectric emf? Obtain the expression for thermo emf in terms of T_1 and T_2 . 08 (2 : 3:1.2.1)
- c. Emf of a thermocouple is $1200 \mu\text{V}$, when working 0°C and 100°C . Its neutral temperature is 300°C . Find the values of a and b for it. 04 (3 : 3:2.1.3)

(OR)

6. a. Describe construction and working of thermo electric generators. 08 (3 : 3:1.1.1)
- b. Describe construction and working of thermo electric coolers. 08 (2 : 3:1.2.1)
- c. The thermo emf of a thermocouple is $2160 \mu\text{V}$, when the cold junction is at 0°C and hot junction at 250°C . Calculate the constant a and b if the neutral temperature is 330°C . 04 (3 : 3:2.1.3)

Module-4

7. a. Explain construction and working of Porous Plug experiment with neat diagram. 05 (2 : 4:1.2.1)
- b. Describe the Lindey's air liquefier. 05 (2 : 4:1.1.1)
- c. Describe the experiment to determine Fermi energy of the given material. 10 (3 : 4:2.1.3)

(OR)

8. a. Explain liquefaction of oxygen by cascade process. 05 (2 : 4:1.2.1)
- b. Explain liquefaction of Helium and its properties. 05 (1 : 4:1.1.1)
- c. Describe the experiment to determine magnetic field intensity along the axis of a circular coil. 10 (2 : 4:1.2.1)

Module-5

9. a. Describe the construction and working of X-ray Diffractometer (XRD). 05 (2 : 5:1.1.1)
- b. Describe the construction and working of Scanning Electron Microscope (SEM). 05 (2 : 5:1.2.1)
- c. Describe the experiment to determine the acceptance angle and numerical aperture of the given optical fiber. 10 (2 : 5:1.2.1)

(OR)

10. a. Derive time independent Schrodinger's equation in one dimension. 05 (2 : 5:1.2.1)
- b. Describe the construction and working of Atomic Force Microscope (AFM) 05 (2 : 5:1.2.1)
- c. Describe the experiment to determine the wavelength of mercury source using diffraction grating. 10 (2 : 5:1.2.1)

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