CBCS SCHEME

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BPHYM102/202

First/Second Semester B.E/B.Tech. Degree Examination, Dec.2024/Jan.2025
Physics for ME Stream

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. M : Marks , L: Bloom's level , C: Course outcomes.
3. VTU formula Handbook is permuted.

		Module – 1	M	L	C
1	a.	Obtain a differential equation for a body undergoing forced oscillation and mention expression for amplitude and phase of oscillation. Discuss the three cases for variation of amplitude with frequency in forced oscillation.	10	L2	CO1
	b.	Define Mach number and Mach angle. Discuss the various types waves based as Mach number.	5	L2	CO1
	c.	A spring undergoes an extension of 5 cm for a load of 50 gm. Find its frequency of oscillations if it is set for vertical oscillations with a load of 200 gm, attached to its bottom, Ignore the mass of the spring.	5	L3	CO5
		OR			
2	a.	Describe the construction and working of hand operated Reddy shock tube. Mention any three applications of shock waves.	10	L2	CO1
	b.	Derive the expression for equivalent force constant for two springs connected in series combinations and mention the expression for period of oscillation.	6	L2	CO1
	c.	The distance between the two pressure sensors in shock tube is 100 mm. The time taken by a shock wave to travel this distance is 100 microsecond. If the velocity of sound under the same conditions is 340 m/s. Find the match number of the shock wave.	4	L3	CO1
		Module – 2			
3	a.	Derive the expression for bending moment in terms of moment of inertia and hence arrive at the expression for bending moment for a beam for circular and rectangular cross section.	10	L2	CO1
	b.	With neat diagram explain the stress-strain curve for elastic materials.	6	L2	CO1
	c.	Calculate the extension produced in a wire of length 2 m and radius 0.013 cm due to force of 15 N applied along its length. (Given Yong's modulus of wire $Y = 2.1 \times 10^{11}$ N/m^2).	4	L3	CO1
		OR			
4	a.	Define Young's modulus, bulk modulus and rigidity modulus. Derive relation between Y, n and σ.	10	L2	CO2
	b.	Discuss any three types of beams.	6	L2	CO2
	c.	Calculate the Poisson's ratio for the material given that $Y = 12.25 \times 10^{10}$ N/mm^2 and $\eta = 4.55 \times 10^{10}$ N/mm^2.	4	L3	CO2
		Module – 3			
5	a.	What is thermocouple? Describe the seeback effect and the Peltier effect.	8	L2	CO2
	b.	Describe the construction of and working of thermoelectric cooler.	7	L2	CO2
	c.	EMF of a thermocouple is 1200 μV, when working between 0°C and 100°C. Its neutral temperature is 300°C . Find the values of a and b for it.	5	L3	CO2

		OR			
6	a.	State and explain Laws of thermoelectricity.	**8**	**L2**	**CO2**
	b.	Explain the construction and working of thermo couples. Mention their advantages.	**7**	**L2**	**CO2**
	c.	The e.m.f in lead-iron thermocouple, one junction of which is at 0°C, is given by $E = 1784t - 2.41t^2$(in μ Volt) where t is temperature in °C. Find the neutral temperature, π and σ.	**5**	**L3**	**CO2**
		Module – 4			
7	a.	Explain Joule Thomson effect. Derive ΔT; $\Delta T = (P1 - P2)/Cp\ [2a/RT - b]$.	**8**	**L2**	**CO3**
	b.	Describe the process of liquefaction of oxygen by cascade process.	**8**	**L2**	**CO3**
	c.	Calculate inversion temperature of gas. Given a = 0.244 atm L^2/mol^2, b = 0.027 L/Mol and R = 0.0821L atm /K/mol.	**4**	**L3**	**CO3**
		OR			
8	a.	Describe construction and working of porous plug experiment. What conclusions have been drawn form it?	**8**	**L2**	**CO3**
	b.	Describe construction and working of platinum resistance thermometer.	**8**	**L2**	**CO3**
	c.	Mention the properties of Liquid Helium.	**4**	**L3**	**CO3**
		Module – 5			
9	a.	With neat diagram, explain the principle, construction and working of atomic force microscopy.	**8**	**L2**	**CO4**
	b.	Determine the construction and working of transmission electron microscape (TEM)	**8**	**L2**	**CO4**
	c.	The spacing between principle planes of NaCL crystal is 2.82°A. It is found that first order Bragg reflection occurs at an angle of 10°. Calculate the wavelength of X-rays.	**4**	**L3**	**CO4**
		OR			
10	a.	With neat diagram, explain the principle, construction and working of scanning electron microscopy.	**8**	**L2**	**CO4**
	b.	Explain the construction and working of X-ray diffractometer and how the crystal size is determined using Scherrer equation.	**8**	**L2**	**CO4**
	c.	Determine the crystallite size given the wavelength of x-ray 10 nm, the peak width 0.5° and peak position 25° for a cubic crystal given K = 0.94.	**4**	**L3**	**CO4**

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