CBCS SCHEME

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BPHYM102/202

First/Second Semester B.E./B.Tech Degree Supplementary Examination, June/July 2024

Applied 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.

		Module – 1	M	L	C
Q.1	a.	Define spring constant. Obtain expression for equivalent force constant for two springs connected in series and parallel combination.	9	L2	CO1
	b.	Obtain a differential equation for a body undergoing forced oscillation and mention expression for amplitude and phase of oscillation.	6	L2	CO1
	c.	A mass of 0.5kg causes an extension of 0.03m in a spring and the system is set for oscillations. Find the force constant of the spring, angular frequency and the time period of the resulting oscillations.	5	L3	CO2
		OR			
Q.2	a.	Describe the construction and working of hand operated Reddy shock tube. Mention any two key feature of Reddy shock tube.	10	L2	CO1
	b.	Discuss the conditions for resonance and explain the sharpness of resonance.	6	L2	CO1
	c.	The distance between the two pressure sensors in a shock tube is 150mm. The time taken by a shock wave to travel the distanced is 0.3ms, if the velocity of sound under the same condition is $340ms^{-1}$. Find the Mach number of the shock wave.	4	L3	CO1
		Module – 2			
Q.3	a.	Define Young's modulus, bulk modulus and rigidity modulus. Derive relation between y, n and σ.	10	L2	CO1
	b.	With neat diagram explain the stress-strain curve for elastic materials.	6	L2	CO1
	c.	Calculate the Poisson's ratio for the material given that $y = 12.25 \times 10^{10} N/m^2$ and $\eta = 4.55 \times 10^{10} N/m^2$.	4	L3	CO2
		OR			
Q.4	a.	Explain the term bending moment. Show the bending moment of a thin uniform bar of rectangular cross section is $\frac{Ybd^3}{12R}$.	10	L2	CO1
	b.	What is the fracture of elastic materials? Discuss on ductile and brittle fractures.	6	L2	CO1
	c.	Calculate the force required to procedure an extension of 1mm in steel wire of length 2m and diameter 1mm [Young's modulus for steel is $2 \times 10^{11} N/m^2$].	4	L3	CO1

Module – 3

Q.5	a.	Discuss seebeck effect and peltier effect with their co-efficient.	8	L2	CO2
	b.	State and explain laws of thermo electricity's.	8	L2	CO2
	c.	The emf in lead-iron thermocouple, one junction of which is at 0°C, is given by $E = 1784t - 2.4t^2$ (in μ volts) where t is temperature in °C. Find the neutral temperature.	4	L3	CO2

OR

Q.6	a.	Derive expression for thermo emf in terms of T_1 and T_2.	8	L2	CO2
	b.	What are thermoelectric materials? Explain low, mid and high temperature thermoelectric materials.	8	L2	CO2
	c.	For Fe – Cu thermocouple it is observed that the thermo emf is zero when one of the junctions is at 20°C and other one is at some higher temperature. If the neutral temperature is 285°C, Calculate the higher temperature. Hence find out the temperature of inversion, if the cold junction temperature is at – 20°C.	4	L3	CO2

Module – 4

Q.7	a.	Explain Joule Thomson effect show that, $\Delta T = \frac{(P_1 - P_2)}{C_P}\left[\frac{2a}{RT} - b\right]$.	10	L2	CO3
	b.	Explain the liquefaction of Helium.	6	L2	CO3
	c.	Calculate inversion temperature of gas. Given a = 0.244atm L^2/mol^2, b = 0.027 L/mol and R = 0.0821 L atm/K/mol.	4	L3	CO3

OR

Q.8	a.	Explain the construction and working of porous plug experiment with neat diagram.	10	L2	CO3
	b.	Explain briefly the applications of cryogenics in food processing and a aerospace.	6	L2	CO3
	c.	In Joule Thomson experiment temperature changes from 100°C to 150°C for pressure change of 20MPa to 170MPa. Calculate Joule Thomson co-efficient.	4	L3	CO3

		Module – 5			
Q.9	a.	With neat diagram, explain the construction and working of x-ray diffractometer.	10	L2	CO4
	b.	Define nano-material and nano-composite and classify the nano-materials based on the dimensional constraints.	6	L2	CO4
	c.	First order Bragg reflection occurs when a monochromatic beam of x-rays of wavelength 0.675 Å is incident on a crystal at a glancing angle of 4.85°. What is the glancing angle for third order Bragg reflection to occur?	4	L3	CO4
		OR			
Q.10	a.	Describe the construction and working of atomic force microscopy.	8	L2	CO4
	b.	Give the principle, construction and working of Scanning Electron Microscope (SEM).	8	L2	CO4
	c.	Determine the crystallite size given the wavelength of x-rays 10nm, the peak width 0.5° and peak position 25° for a cubic crystal given K = 0.94.	4	L3	CO4

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