CBCS SCHEME

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BPHYM102/202

First/Second Semester B.E./B.Tech. Degree 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.***
3. ***VTU Hand book is permitted.***

		Module – 1	M	L	C
Q.1	a.	Define Spring Constant. Obtain an expression for equivalent force constant for two springs in series and parallel combination. What is the expression for time period of oscillation in above cases?	8	L2	CO1
	b.	What is Mach Number? Distinguish subsonic ultrasonic, supersonic and hypersonic flow.	8	L2	CO1
	c.	In Reddy tube experiment, it was found that the time taken to travel between the two sensors is 195 microseconds. If the distance between the two sensors is 100mm. Find Mach Number. Given velocity of sound under the same conditions is 340m/s.	4	L3	CO1
		OR			
Q.2	a.	Obtain a differential equation for a body undergoes forced oscillation and mention the expression for amplified and phase of oscillation.	8	L2	CO1
	b.	What are shock waves? Describe the construction and working of Reddy shock tube with neat diagram.	7	L2	CO1
	c.	A spring undergoes extension of 5cm for a load of 50gm. Find its frequency of oscillation. If it set for vertical oscillation with a load of 200gm, attached to its bottom. Ignore the mass of the spring.	5	L3	CO5
		Module – 2			
Q.3	a.	Explain the types of strain. Explain the nature of elasticity with the help of stress- strain diagram.	8	L2	CO1
	b.	Define Poisson's ratio, Young's modulus, Bulk modulus. Derive the relation for 'Y', 'η' and 'σ'.	8	L2	CO1
	c.	Calculate the force required to produce an extension of 3mm in steel wire of length 3m and diameter 2mm ($y = 20 \times 10^{10} N/m^2$).	4	L3	CO1
		OR			
Q.4	a.	What is bending moment? Derive the expression for the bending moment in terms of moment of Inertia. Hence, arrive the expression for a bending moment of circular and rectangular cross sections.	8	L2	CO1
	b.	Discuss the different types of beams and explain 'I' section Girder and their Engineering applications.	8	L2	CO1
	c.	A metal wire of length 1.5m is loaded and an elongation of 2mm is produced. If the diameter of wire is 1mm. find the change in diameter of wire when elongated (where $\sigma = 0.24$).	4	L3	CO1
		Module – 3			
Q.5	a.	What is Seeback effect? Explain variation of Thermo-emf with temperature and obtain the relation between inversion temperature and neutral temperature.	8	L2	CO2

	b.	What are thermo couples? Explain laws of thermo – electricity with neat sketch.	**8**	**L2**	**CO2**
	c.	EMF of a thermo couple is 1200 microvolts when working between 0ºC and 100ºC. Its neutral temperature is 300ºC. Find the value of 'a' and 'b' for it.	**4**	**L3**	**CO2**
		OR			
Q.6	**a.**	What are thermo-eletric materials? Explain Low, mid and high temperature thermo electric materials and mention their applications.	**8**	**L**	**CO**
	b.	Describe the construction and working of Thermo electric generator and mention the applications of it.	**8**	**L**	**CO**
	c.	The emf in microvolts of a thermocouple one junction of which is at 0ºC is given by $e = 1600T - 4T^2$, where TºC is the temperature of hot junction. Find neutral temperature and Piltier co-efficient.	**4**	**L**	**CO**
		Module – 4			
Q.7	**a.**	Explain the construction and working of porous plug experiment with neat diagram.	**8**	**L2**	**CO3**
	b.	Describe the Lindey's air liqufier.	**8**	**L2**	**CO3**
	c.	Calculate the inversion temperature of gas. Given a = 0.244 at m L^2/moL^2, b = 0.027 L/moL and R = 0.0821 Latm/K/mol.	**4**	**L3**	**CO3**
		OR			
Q.8	**a.**	Explain Joule-Thomson effect. Derive $\Delta T = \left[\frac{P_1 - P_2}{C_p}\right]\left(\frac{2a}{RT} - b\right)$.	**8**	**L2**	**CO3**
	b.	What is Cryogenics? Explain the applications of cryogenics in aerospace and food processing.	**8**	**L2**	**CO3**
	c.	A platinum resistance thermometer has resistance of 2Ω and 0ºC and 3Ω at 100ºC. What will be the temperature when resistance indicates 5Ω.	**4**	**L3**	**CO3**
		Module – 5			
Q.9	**a.**	Explain the construction and working of X-ray diffractometer and discuss the Scherrer's method for determining Crystallite size.	**8**	**L2**	**CO4**
	b.	Describe construction and working of SEM and mention its applications.	**8**	**L2**	**CO4**
	c.	An X-ray undergoes First order Bragg's diffraction by the crystal with 'd' spacing 3.6 Å at a glancing angle 12º calculate wavelength of X-rays.	**4**	**L3**	**CO4**
		OR			
Q.10	**a.**	What are Nonomaterials and Nano composites? Discuss their classification based on their dimensional constraints.	**8**	**L2**	**CO4**
	b.	Describe the principle, construction and working of X-ray photo Electron spectroscopy and mention its advantages and applications.	**8**	**L2**	**CO4**
	c.	Determine the Crystallite size using Scherrer's relation. Given λ = 1.5 Å, 2θ = 35º and k = 0.94 peak full width half maxima = 0.5º.	**4**	**L3**	**CO4**

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