MAKE-UP EXAM

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BPHYM102/202

First/Second Semester B.E./B.Tech. Degree Examination, Nov./Dec.2023
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. VTU Formula Hand Book is permitted.
3. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	What are damped oscillations? Discuss the theory of damped oscillation and three possible cases for damped oscillations.	08	L2	CO1
	b.	What are shock waves and give the characteristics of shock waves. Discuss the construction and working of Reddy's shock tube.	07	L2	CO1
	c.	In the spring constant experiment, a mass of 0.7 kg causes an extension of 0.05 m in a spring and system is set for oscillations. Find Force constant of spring and Angular frequency.	05	L3	CO5
		OR			
Q.2	a.	What is Simple Harmonic Motion and give the differential equation of Simple Harmonic Motion. Obtain the expression for effective spring constant and Time Period for two springs connected in parallel.	08	L2	CO1
	b.	What are forced oscillations? Discuss the conditions for resonance and explain the sharpness of resonance.	07	L2	CO1
	c.	Calculate the maximum amplitude of vibration of a system whose natural frequency is 850 Hz when it oscillates in a resistive medium for which the value of damping/unit mass is 0.008 rad/sec under the action of an external periodic force/unit mass of amplitude 7 N/kg with tunable frequency.	05	L3	CO5
		Module – 2			
Q.3	a.	Discuss Neutral Surface and derive the expression for Bending moment interms of moment of Inertia and hence arrive at the expression for Bending moment for rectangular and circular cross sections.	08	L2	CO1
	b.	What are Young's modulus, Rigidity modulus and Poisson's ratio? Derive the relation between them.	07	L2	CO1
	c.	In single Cantilever experiment, find the Young's modulus of the rectangular bar of breadth 2.5 cm and thickness 0.480 cm. Depression observed for the mass of 200 gm is 0.175 cm. Mass is suspended at a distance of 30 cm from the fixed end.	05	L3	CO5
		OR			
Q.4	a.	Discuss the stress-strain diagram. Explain the I-section girder and its engineering applications.	09	L2	CO1
	b.	What is Fatigue failure? Discuss the factors affecting on fatigue.	07	L2	CO1
	c.	A metal wire of length 1.7 m is loaded and elongation of 2 mm is produced. If the diameter of the wire is 1.2 mm, find the change in the diameter of the wire when elongated. (Given $\sigma = 0.24$) .	04	L3	CO1
		Module – 3			
Q.5	a.	Discuss the variation of thermoelectric emf with temperature and obtain the relation between inversion temperature and neutral temperature.	08	L2	CO2
	b.	What is thermocouple? Describe Seebeck effect and Peltier effect with their co-efficients.	08	L2	CO2
	c.	For Fe-Cu thermocouple it is observed that the thermo emf is zero, when one of the junctions is at 25° C and the other is at some higher temperature. If the neutral temperature is 275° C, calculate the higher temperature.	04	L2	CO3

		OR			
Q.6	a.	Describe the construction and working of thermoelectric generator. Discuss its application in space program.	08	L2	CO2
	b.	What is thermo emf? Derive the expression for thermo emf in terms of T_1 and T_2.	08	L2	CO2
	c.	The emf of thermocouple, one junction of which is kept at $0^\circ C$ is given as, $E = a(T-273) + b(T-273)^2$. Find the Peltier co-efficient.	04	L3	CO2
		Module – 4			
Q.7	a.	Explain Joule-Thomson effect. Derive the expression for Joule-Thomson co-efficient.	08	L2	CO3
	b.	Describe the process of liquefaction of oxygen by cascade process.	08	L2	CO3
	c.	In Joule-Thomson experiment, due to throttling, pressure of the fluid changed from 30 MPa to 190 MPa. Joule Thomson co-efficient is $\frac{1}{5}\mu K/Pa$. Find the change in temperature of the fluid.	04	L3	CO3

		OR			
Q.8	a.	Discuss the principle, construction and working of Lindey's air liquefier with neat diagram.	08	L2	CO3
	b.	Discuss the principle, construction and working of liquefaction of Helium. Mention the properties of liquid Helium.	08	L2	CO3
	c.	Explain briefly the applications of cryogenics in Tribology.	04	L3	CO3
		Module – 5			
Q.9	a.	With neat diagram, explain the principle, construction and working of scanning electron microscopy.	08	L2	CO4
	b.	Discuss the construction and working of X-Ray diffractometer and how the crystal size is determined by using Scherrer's equation.	08	L2	CO4
	c.	Calculate the energy of electrons that produce Bragg's diffraction of first order at 30° when incident on crystal with interplanar spacing 1.96 Å.	04	L3	CO4
		OR			
Q.10	a.	Describe the construction and working of Transmission electron microscope and give the advantages.	08	L2	CO4
	b.	With neat diagram, explain the principle, construction and working of Atomic Force Microscopy and give its applications.	08	L2	CO4
	c.	Determine the wavelength of X-rays for crystal size of 1.79 μm, peak width is 0.9° and peak position 48°, for a cubic crystal. Given Scherrer's constant, $K = 0.92$.	04	L3	CO4

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