CBCS SCHEME - Summer Semester

USN | | | | | | | | | | |

BPHYM102/202

First/Second Semester B.E./B.Tech. Degree Examination, June/July 2025
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 Formula Hand Book is permitted.

		Module – 1	M	L	C
1	a.	Define forced vibration. Give the theory of forced vibration and hence obtain the expression for amplitude.	9	L2	CO1
	b.	Define Mach number and Mach angle. Mention any four application of shock waves.	6	L1	CO1
	c.	A mass of 6 kg stretches a spring 0.3 m from its equilibrium. The mass is removed and another body of mass 1 kg is hanged from the spring. What is the period of motion if the spring is none attached and released?	5	L3	CO1
		OR			
2	a.	With a neat diagram explain the construction and working of Reddy shock tubes.	8	L2	CO1
	b.	Define stiffness factor. Derive the expression for force constant for series and parallel combination of springs.	8	L1	CO1
	c.	In a Reddy tube experiment it was found that the time taken by a shock wave to travel between the two sensors is 195 μs. If the distance between the two sensors is 100 mm and velocity of sound is 340 ms^{-1}, Find the mach number of the shock wave.	4	L3	CO1
		Module – 2			
3	a.	Define Young's modulus (y) , Rigidity modulus (η) and poisson's ratio (σ). Obtain the relation between y , η and σ.	10	L2	CO1
	b.	State Hook's law, explain the stress-strain curve.	6	L2	CO1
	c.	A load of 20 kg produces an extension of 1 mm in a wire of 3 m in length and 1 mm in diameter. Calculate the Youngs modulus of the wire.	4	L3	CO1
		OR			
4	a.	Define Bench's moment. Obtain the expression for Bench's moment for material rectangular cross section.	10	L2	CO5
	b.	Define Fatigue. Explain the factors effecting the Fatigue.	6	L2	CO1
	c.	A material has Poission's ratio 0.2. If a uniform rod suffers longitudinal strain of 4×10^{-3} Calculate the lateral strain.	4	L3	CO1
		Module – 3			
5	a.	Derive expression for thermo emf in terms of T_1 and T_2.	10	L2	CO2
	b.	Explain seeback and Peltier effect.	6	L2	CO2
	c.	EMF of a thermocouple is 1200μv. When working between 0°C and 100°C. Its neutral temperature is 300°C. Find the values of a & b.	4	L3	CO2

		OR			
6	a.	Explain the construction and working of thermocouple.	**8**	**L2**	**CO2**
	b.	The emf of a thermocouple, one junction of which is kept at 0°C is given by $E = at + bt^2$ Determine the neutral temperature, temperature of inversion and Peltier coefficient.	**8**	**L3**	**CO2**
	c.	The emf on lead – iron thermocouple, ore junction of which is at 0°C is given by $E = 1600t - t^2$ where t°C is the temperature of the hot junction. If t = 27°C, Calculate the Peltier coefficient.	**4**	**L3**	**CO2**
		Module – 4			
7	a.	Describe the Lindey's air liquifier.	**8**	**L2**	**CO3**
	b.	Derive $\Delta T = \frac{P_1 - P_2}{C_p}\left[\frac{29}{RT} - b\right]$ using Joule Thomson effect.	**8**	**L2**	**CO3**
	c.	Calculate the inversion temperature of gas Given a = 0.244 atm L^2/mol^2 b = 0.027 L/nud and R = 0.0821 L atom/K/mol.	**4**	**L3**	**CO3**
		OR			
8	a.	Describe the construction and working of Porous Plug experiment.	**8**	**L2**	**CO3**
	b.	Describe the construction and working of platinum resistance thermometers.	**8**	**L2**	**CO3**
	c.	In a diffraction grating experiment laser light undergoes second order diffraction for diffraction angle 1.48°. The grating constant $d = 5.05 \times 10^{-5}$ m and the distance between the grating and the source is 0.60 m, find the wavelength of laser light.	**4**	**L3**	**CO5**
		Module – 5			
9	a.	Describe the construction and working of scanning electron microscope (SEM)	**8**	**L2**	**CO4**
	b.	Describe the construction and working of transmission electron microscope (TEM)	**8**	**L2**	**CO4**
	c.	In a calcite crystal, second order Bragg's reflections occur from the planes with d-spacing 3 A°, at a glancing angle of 24°. Calculate the path difference between X – rays reflected from the two adjacent planes.	**4**	**L3**	**CO4**
		OR			
10	a.	Describe the construction and working of X – ray photoelectron spectroscopy.	**8**	**L2**	**CO4**
	b.	Describe the construction and working of Atomic force microscope.	**8**	**L2**	**CO5**
	c.	Determine the crystal size given the wavelength of X-ray 12 nm, the peak width 0.5° and peak position 23° for a cubic crystal. Given k = 0.94.	**4**	**L3**	**CO4**

* * * * *