



CBCS SCHEME

BPHYM102/202

First/Second Semester B.E/B.Tech. Degree Examination, June/July 2026 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.	Obtain differential equation for a body undergoing forced oscillation and mention expression for amplitude and phase of forced oscillation.	9	L2	CO1
	b.	Describe the construction and working of Reddy shock tube with the help of a diagram.	6	L2	CO1
	c.	A mass of 0.4 kg causes an extension of 0.02 m in a spring and the system is set for oscillations. Find the force constant of the spring.	5	L3	CO1
OR					
2	a.	What are damped oscillations? Give the theory of damped oscillation and hence discuss the case of critical damping.	9	L2	CO1
	b.	What are Shock Waves? Mention its applications.	6	L2	CO1
	c.	In a Reddy shock tube experiment the time taken by shock waves to travel between the two sensors is 180 μ sec, if the distance between the two sensors is 100 mm. Calculate the Mach Number. Assume that speed of sound is 340 m/sec.	5	L3	CO1
Module – 2					
3	a.	Define Young's Modulus (Y), Rigidity Modulus(η) and Poisson's Ratio (σ). Derive the relation between them.	10	L2	CO1
	b.	Explain different types of beams and mention engineering applications.	6	L2	CO1
	c.	The Bulk modulus for a material is $60 \times 10^9 \text{ N/m}^2$ and its modulus of rigidity is $40 \times 10^9 \text{ N/m}^2$. Calculate the Young's Modulus for the given material.	4	L3	CO1
1 of 3					

OR

4	a.	Define Bending Moment. Derive the expression for Bending Moment in terms of Moment of Inertia.	10	L2	CO1
	b.	Explain the Nature of Elasticity with the help of stress-strain diagram.	6	L2	CO1
	c.	Calculate the force required to produce an extension of 1 mm in steel wire of length 2 m and diameter 1 mm (Given Young's Modulus of wire $Y = 2 \times 10^{11} \text{ N/m}^2$.)	4	L3	CO1

Module – 3

5	a.	Discuss the Seebeck effect and Peltier effect with their coefficients.	9	L2	CO2
	b.	Explain the application of thermoelectricity on refrigerator.	6	L2	CO2
	c.	The thermo emf of a thermocouple is $1200 \mu\text{V}$ when the cold junction is at 0°C and hot junction at 100°C . Calculate the constants a and b, if the neutral temperature is 300°C .	5	L3	CO2

OR

6	a.	Explain the construction and working of Thermoelectric Generator (TEG).	9	L2	CO2
	b.	Explain working of thermoelectric coolers.	6	L2	CO2
	c.	The emf in microvolts of a thermocouple one junction of which is at 0°C is given by $e = 1600 T - 4T^2$ where $T^\circ\text{C}$ is the temperature of hot junction. Find neutral temperature and Peltier coefficient.	5	L3	CO2

Module – 4

7	a.	Describe the construction and working of porous plug experiment with neat diagram.	8	L2	CO3
	b.	Explain the construction, working and advantages of platinum resistance thermometer.	8	L2	CO3
	c.	In a Joule –Thomson experiment temperature changes from 100°C to 150°C for a change of pressure from 20 MPA to 170 MPA. Calculate the Joule –Thomson coefficient.	4	L2	CO3

OR

8	a.	Explain the Liquefaction of oxygen by cascade process.	8	L2	CO3
	b.	What is Joule – Thomson effect? Derive $\Delta T = \frac{(P_1 - P_2)}{C_p} \left[\frac{2a}{R} b \right]$ and hence discuss 3 cases.	8	L2	CO3
	c.	Write the application of cryogenic in aerospace and food processing.	4	L2	CO3

Module – 5

9	a.	Explain the construction and working of X-ray diffractometer and the crystal size determined using Scherrer equation.	8	L2	CO4
	b.	With a neat diagram, explain the principle, construction and working of AFM.	8	L2	CO4
	c.	Determine the wavelength of X-Rays for crystal size of 1190 nm peak width 0.5° and peak position 35° for a cubic crystal. Given Scherrer constant $K = 0.92$.	4	L2	CO4
OR					
10	a.	With a neat diagram, explain the principle, construction and working of Scanning Electron Microscopy (SEM).	8	L2	CO4
	b.	Describe the principle, construction and working of Transmission Electron Microscopy (TEM).	8	L2	CO4
	c.	A beam of X-Ray's, $\lambda = 0.842 \text{ \AA}$ is incident on a crystal at a glancing angle of 8.583° when first order Bragg reflection occurs. Calculate the glancing angle for 3 rd order reflection.	4	L2	CO4
