Basavarajeswari Group of Institutions

2022 SCHEME

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

USN										

Course Code	2	2	P	H	Y	M	12	/	22

First/Second Semester B.E. Degree Summer Semester Examinations, September/October 2025

PHYSICS FOR MECHANICAL ENGINEERING STREAM

Duration: 3 hrs **Max. Marks: 100**

Note: ***1. Answer any* FIVE *full questions, choosing* ONE *full question from each module.***
2. Handbook is permitted.
3. Missing data, if any, may be suitably assumed.

Q. No		*Question*	*Marks*	*(RBTL:CO:PI)*
		MODULE – 1		
1.	**a.**	Define simple harmonic motion. Derive the equation for simple harmonic motion using Hooke's law.	**08**	**(2:1:1.1.1)**
	b.	With a neat diagram explain the construction and working of Reddy tube. Mention any four applications of Shock waves.	**08**	**(2:1:1.1.1)**
	c.	A man weighing 600 N steps on a spring scale machine, the spring in the machine is compressed by 1 cm. Find the force constant of the spring.	**04**	**(3:1:1.2.1)**
		(OR)		
2.	**a.**	What is spring constant? Obtain an expression for equivalent spring constant for series and parallel combination.	**08**	**(2:1:1.1.1)**
	b.	What are damped oscillations? Derive the expression for decaying amplitude and hence discuss the case of critical damping.	**08**	**(2:1:1.1.1)**
	c.	The distance between the two pressure sensors in a shock tube is 150 mm. The time taken by a shock wave to travel this distance is 0.3 ms. If the velocity of sound under the same condition is 340 ms^{-1}. Find the Mach number of the shock wave.	**04**	**(3:1:1.2.1)**
		MODULE – 2		
3.	**a.**	State Hooke's law. Briefly explain stress-strain curve.	**08**	**(2:2:1.1.1)**
	b.	Derive the relation between Bulk modulus (K), Young's modulus (Y) and Poisson's ratio. What are the limiting values of Poisson's ratio?	**08**	**(2:2:1.1.1)**
	c.	Calculate the Poisson's ratio of steel given its Young's modulus = 2×10^{11} N/m^2 and rigidity modulus = 8.3×10^{10} N/m^2.	**04**	**(3:2:1.2.1)**
		(OR)		
4.	**a.**	Define bending moment. Derive the expression for bending moment in terms of moment of inertia.	**08**	**(2:2:1.1.1)**
	b.	Define Young's modulus. Derive the expression for Young's modulus by single cantilever.	**08**	**(2:2:1.1.1)**
	c.	Calculate the extension produced in a wire of length 2 m and radius 0.013×10^{-2} m due to a force of 14.7 N applied along its length. (Given Young's Modulus of the material of the wire, $Y = 2.1 \times 10^{11}$ N/m^2.	**04**	**(3:2:1.2.1)**

Note: (**RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI - Performance Indicator)**

MODULE – 3

5.	**a.**	Describe the construction and working of Thermo Electric Generators (TEG). Mention their applications.	**08**	**(2:3:1.1.1)**
	b.	State Seeback effect and Peltier effect. Obtain the relation between thermo emf and temperature.	**08**	**(2:3:1.1.1)**
	c.	Describe thermopile.	**04**	**(3:3:1.2.1)**
		(OR)		
6.	**a.**	Explain the construction and working of thermocouples. Mention their applications.	**08**	**(2:3:1.1.1)**
	b.	Explain the working of thermoelectric coolers.	**08**	**(2:3:1.1.1)**
	c.	State and explain laws of thermoelectricity.	**04**	**(3:3:1.2.1)**

MODULE – 4

7.	**a.**	Explain the Carnot's engine with a neat diagram.	**10**	**(2:4:1.1.1)**
	b.	Explain how to calculate the spring constant by writing the diagram, apparatus formulae, tabular column, and procedure.	**10**	**(3:5:1.2.1)**
		(OR)		
8.	**a.**	Describe the Porous plug experiment.	**10**	**(2:4:1.1.1)**
	b.	Write detail how to calculate with a circuit diagram and tabular column required apparatus and determine the bandwidth and quality factor for LCR series resonance frequency.	**10**	**(3:5:1.2.1)**

MODULE – 5

9.	**a.**	Describe the construction & working of Transmission Electron Microscopy (TEM)	**10**	**(2:4:1.1.1)**
	b.	Describe the experiment to determine wavelength of mercury source.	**10**	**(3:5:1.2.1)**
		(OR)		
10.	**a.**	Describe the construction and working of X - ray diffractometer.	**10**	**(2:4:1.1.1)**
	b.	Explain in detail how to calculate acceptance angle and numerical aperture of the optical fiber.	**10**	**(3:5:1.2.1)**

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