Basavarajeswari Group of Institutions

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

USN										Course Code	2	2	P	H	Y	M	2	2

Second Semester B.E. Degree Examinations, Sept/Oct 2023

PHYSICS FOR ME STREAM

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

*Note: 1. Answer any **FIVE** full questions, choosing **ONE** full question from each module.*
2. Physical constants: Velocity of light (c) = 3 x 10^8 m/s ; Plank's constant (h) = 6.63 x 10^{-34} J-S ; Mass of the electron (m) = 9.11 x 10^{-31} Kg ; Boltzmann constant (k) = 1.38 x 10^{-23} J/K ; Avagadro number (N_A) = 6.02 x 10^{26} /K mole Charge of the electron (e) = 1.603 x 10^{-19} C. Missing data, if any, may be suitably assumed

O. No		Question	Marks	(RBTL:CO: PI)
		MODULE – 1		
1.	a.	Find the effective spring constant in case of spring connected in series and parallel combination	8	(1 :1: 1.1.1)
	b.	Define SHM and mention any two examples. Obtain differential equation of motion for SHM.	8	(1 :1: 1.1.1)
	c.	The mass of 0.5 Kg causes an extension of 0.03 m in a spring and the system is set for oscillation. Find force constant of the spring and time period of oscillation.	4	(3 :1: 1.2.1)
		OR		
2.	a.	With a neat diagram, explain the construction and working of Reddy's shock tube. Mention applications of shock waves.	8	(2 :1: 1.1.1)
	b.	What are damped oscillations? Obtain a differential equation for a body undergoing damped oscillations.	8	(1 :1: 1.1.1)
		In a Reddy tube experiment, the time taken by a shock wave to travel between two sensors is 195 μs. If the distance between the two sensors is 100 mm, find the Mach number.	4	(3 :1: 1.2.1)
		MODULE – 2		
3.	a.	State Hooke's law. Briefly explain stress-strain curve	8	(1 :2: 1.1.1)
	b.	Derive an expression for Young's modulus of a rectangular material of a single cantilever beam.	8	(2 :2: 1.1.1)
	c	Calculate the force required to produce an extension of 1 mm in steel wire of length 2 m and diameter 1 mm. (Young's modulus of the wire is Y = 2×10^{11} N/m^2).	4	(3 :2: 1.2.1)
		OR		
4.	a.	Define the terms Young's modulus and rigidity modulus. Derive the relation between Young's modulus (Y), rigidity modulus (η) and Poisson's ratio (σ).	8	(2 :2: 1.1.1)
	b.	Discuss ductile fracture, brittle fracture and fatigue failures.	8	(3 :2: 1.1.1)
		A brass bar of length 1m and area 0.01-meter square is clamped firmly in a horizontal position at one end. A weight of 1 Kg is applied at the other end. What depression would be produced. (Given, Y = 9.78×10^{10} N/m^2).	4	(3 :2: 1.2.1)
		MODULE – 3		
5.	a.	What is thermocouple? Describe Seebeck effect and Peltier effect	8	(1 :3: 1.1.1)

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

	b.	What is thermoelectric emf? Obtain the expression for thermo emf in terms of T_1 and T_2.	**8**	**(1 :3: 1.1.1)**
	c.	Emf of a thermocouple is 1200 μV, when the working between 0° C and 100° C. Its neutral temperature is 300° C. Find the values of a and b for it.	**4**	**(3 :1: 1.2.1)**
		OR		
6.	**a.**	Describe construction and working of thermo electric coolers	**8**	**(1 :3: 1.1.1)**
	b.	What is the thermoelectric effect? State and explain laws of thermo electricity	**8**	**(1 :3: 1.1.1)**
		The thermo emf of a Cu-Fe thermocouple is 2160 μV when the cold junction is at 0° C and the junction at 250° C. Calculate the constants a and b it the neutral temperature is 330° C.	**4**	**(3 :1: 1.2.1)**
		MODULE – 4		
7.	**a.**	What is Carnot's cycle? Describe the different operations involved in Carnot cycle.	**5**	**(1 :4: 1.1.1)**
	b.	State the first, second and third laws of thermodynamics and discuss their significance.	**5**	**(1 :4: 1.1.1)**
		Describe the experiment to determine young's modulus of the given material bar by single cantilever.	**10**	**(3 :5: 1.2.1)**
		OR		
8.	**a.**	Explain construction and working of Porous Plug experiment with neat diagram	**5**	**(2 :4: 1.1.1)**
	b.	Describe the Lindey's air liquefier.	**5**	**(3 :4: 1.1.1)**
		Describe the experiment to determine spring constant in series and parallel combination.	**10**	**(3 :5: 1.2.1)**
		MODULE – 5		
9.	**a.**	Describe the construction and working of X-ray Diffractometer.	**5**	**(3 :4: 1.1.1)**
	b.	Describe the construction and working of Scanning electron microscopy.	**5**	**(3 :4: 1.1.1)**
		Describe the experiment to determine the wavelength of mercury source using diffraction grating	**10**	**(3 :5: 1.2.1)**
		OR		
10.	**a.**	Define nano materials and nano composites? Explain sol-gel method for production of nano materials.	**5**	**(1 :4: 1.1.1)**
	b.	Describe the construction and working of Transmission electron microscopy.	**5**	**(3 :4: 1.1.1)**
		Describe the experiment to determine the acceptance angle and numerical aperture of the given optical fibre.	**10**	**(3 :5: 1.2.1)**

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