Model Question Paper-1 with effect from 2022-23 (CBCS Scheme)

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

First/Second Semester B.E. Degree Examination

Subject Title APPLIED PHYSICS FOR MECHNICAL STREAM

TIME: 03 Hours

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.
02. Draw neat sketches where ever necessary
03. **Constants :** Speed of Light 'c' = 3×10^8 ms^{-1}, Boltzmann Constant 'k' = 1.38×10^{-23} JK^{-1}, Planck's Constant 'h' = 6.625×10^{-34} Js , Acceleration due to gravity 'g'= 9.8 ms^{-2}, Permittivity of free space ε_0'=8.854×10^{-12} F m^{-1}

		Module -1	*Bloom's Taxonomy Level	Marks
Q.01	a	Obtain a differential equation for a body undergoing forced oscillation & mention expression for amplitude & Phase of oscillation. Discuss the three cases for variation of amplitude with frequency in forced oscillation.	L2	10
	b	Define Mach number and Mach angle. Discuss the Mach regimes.	L2	05
	c	A 20 gm oscillator with natural frequency 10 rad/s is vibrating in damping medium. The damping force is proportional to the velocity of the vibration. If the damping coefficient is 0.17, how does the oscillation decay.	L3	05
		OR		
Q.02	a	Describe the construction & working of hand operated Reddy Shock tube. Mention any two key feature of Reddy shock tube.	L2	10
	b	Derive the expression for equivalent force constant for two springs connected in series combination & mention the expression for period of oscillation.	L2	06
	c	The Distance between two pressure sensors in a shock wave tube is 100 mm. The time taken by shock wave to travel this distance is 200 microsecond. If the velocity of sound under the sane condition is 340m/s. Find the mach number of the shock wave	L3	04
		Module-2		
Q. 03	a	Define Young's modulus, Bulk modulus & rigidity modulus. Derive relation between Y, n & σ.	L2	10
	b	With neat diagram explain the stress-strain curve for elastic materials.	L2	06
	c	Calculate the Possion's ratio for the material given that $Y=12.25 \times 10^{10}$ N/m^2 & $\eta=4.55 \times 10^{10}$ N/m^2.	L3	04
		OR		
Q.04	a	Derive the expression for bending moment in terms of moment of inertia and hence arrive at the expression for bending moment for a beam for circular and rectangular cross section.	L2	09
	b	Explain different elastic moduli and Mention the Relation between them.	L2	07
	c	Calculate the extension produced in a wire of length 2 m and radius 0.13 cm due to a force of 15 N applied along its length. (Given: Young's modulus of wire $Y= 2.1 \times 10^{11}$ N/m^2).	L3	04
		Module-3		
Q. 05	a	Derive expression for thermo emf in terms of T1 and T2.	L2	08
	b	Describe the construction and working thermoelectric generator (TEG).	L2	07

	c	The e. m. f. in lead – iron thermocouple, one junction of which is at 0^oC, is given by $E = 1784\ t - 2.4\ t^2$ $(in\ \mu\ volts)$ where t is temperature in $^o\ C$. Find the neutral temperature, π and σ.	L3	05
		OR		
Q. 06	a	What is thermocouple? Describe the Seebeck effect and the Peltier effect	L2	08
	b	Explain applications of thermoelectricity on refrigerator.	L2	07
	c	The thermo *emf* of a *Cu-Fe* thermocouple is $2160\mu V$ when the cold junction is at 0^oC and hot junction at 250^oC. Calculate the constants a and b if the neutral temperature is 330^oC.	L3	05
		Module -4		
Q. 07	a	Explain Joule Thomson Effect. Derive $\Delta T = \frac{(P_1-P_2)}{C_p}\left[\frac{2a}{RT} - b\right]$	L2	08
	b	Describe the process of liquefaction of oxygen by cascade process	L2	08
	c	Calculate inversion temperature of gas. Given: a=0.244 atm L^2/mol^2, b=0.027 L/mol & R=0.0821 L atm/K/mol.	L3	04
		OR		
Q. 08	a	Describe construction and working of Porous plug experiment. What conclusions have been drawn from it.	L2	08
	b	Describe construction and working of platinum resistance thermometer.	L2	08
	c	Mention the properties of Liquid Helium.	L3	04
		Module-5		
Q. 09	a	With neat diagram, explain the principle, construction and working of Scanning Electron Microscopy .	L2	08
	b	With neat diagram, explain the principle, construction and working of Atomic Force Microscopy	L2	08
	c	The spacing between principal planes of NaCl crystal is 2.82Å. it is found that first order Bragg reflection occurs at an angle of 10^0. Calculate the wavelength of X-rays	L3	04
		OR		
Q. 10	a	Explain the construction and working of X-Ray diffractometer and how the crystal size is determined using Scherrer equation.	L2	08
	b	Give the Principle, construction and working of Transmission Electron Microscopy	L2	07
	c	Determine the wave length of X-rays for crystal size of 1.19 μm, peak width is 0.5 ^{o} and peak position 35^o, for a cubic crystal. Given Scherrer's constant k=0.92.	L3	05

*****Bloom's Taxonomy Level: Indicate as L1, L2, L3, L4, etc. It is also desirable to indicate the COs and POs to be attained by every bit of questions.

Table showing the Bloom's Taxonomy Level, Course Outcome and Program Outcome				
Question		**Bloom's Taxonomy Level attached**	**Course Outcome**	**Program Outcome**
Q.1	(a)	L2	1	1,2,12
	(b)	L2	1	1,2
	(c)	L3	1	1,2
Q.2	(a)	L2	1	1,2
	(b)	L2	1	1,2,12
	(c)	L3	1	1,2
Q.3	(a)	L2	1	1,2,12
	(b)	L2	1	1,2,12
	(c)	L3	1	1,2
Q.4	(a)	L2	1	1,2,12
	(b)	L2	1	1,2
	(c)	L3	1	1,2
Q.5	(a)	L2	2	1,2,12
	(b)	L2	2	1,2,12
	(c)	L3	2	1,2
Q.6	(a)	L2	2	1,2,12
	(b)	L2	2	1,2,12
	(c)	L3	2	1,2
Q.7	(a)	L2	3	1,2,12
	(b)	L2	3	1,2,12
	(c)	L3	3	1,2
Q.8	(a)	L2	3	1,2,12
	(b)	L2	3	1,2,12
	(c)	L3	3	1,2
Q.9	(a)	L3	4	1,2,12
	(b)	L2	4	1,2,12
	(c)	L3	4	1,2
Q.10	(a)	L2	4	1,2,12
	(b)	L2	4	1,2,12
	(c)	L3	4	1,2