Model Question Paper-II 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 **Max. Marks: 100**

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	What are damped and forced oscillations? Obtain a differential equation for a body undergoing damped oscillation & mention the expression for the equation of motion.	L2	09
	b	What are shock waves? Mention three properties and applications of shock waves.	L2	07
	c	The distance between the two pressure sensors in a shock tube is 150 mm. The time taken by a shock wave to travel the distance is 0.3ms. If the velocity of sound under the same condition is 340 m/s. Find the Mach number of the shock wave.	L3	04
		OR		
Q.02	a	Define spring constant. Obtain expression for equivalent force constant for two springs connected in series and parallel combination	L2	09
	b	Discuss the conditions for resonance and explain the sharpness of resonance.	L2	06
	c	Calculate the peak amplitude of vibration of a system whose natural frequency is 1000Hz when it oscillates in a resistive medium for which the value of damping/unit mass is 0.008rad/ per second under the action of an external periodic force/unit mass of amplitude 5 N/kg, with tunable frequency.	L3	05
		Module-2		
Q. 03	a	Explain the term bending moment. Show the bending moment of a thin uniform bar of rectangular cross section is $\frac{Ybd^3}{12R}$	L2	10
	b	Discuss fatigue failures	L2	05
	c	A rod of cross sectional area 15 mm x 15 mm and 1 m long is subjected to compressive load of 22.5 kN. Calculate the stress and decrease in length if Young's modulus is 200 GN/m^2	L3	05
		OR		
Q.04	a	Define Young's modulus, Bulk modulus, Rigidity of modulus & Poisson's ratio. Discuss the limiting values of Poisson's ratio.	L2	10
	b	Discuss the different types of beams and mention their engineering applications	L2	06
	c	The Young's modulus for a material is 100×10^9 N/m^2 and its modulus of rigidity is 40×10^9 N/m^2 .Determine its bulk modulus for the given material	L3	04

Module-3				
Q. 05	a	State and explain Laws of thermoelectricity.	L2	08
	b	Describe the construction and working thermoelectric cooler	L2	07
	c	For Fe-Cu thermocouple it is observed that the thermo emf is zero when one of the junctions is at 20^oC and the other one is at some higher temperature. If the neutral temperature is 285^oC, calculate the higher temperature. Hence find out the temperature of inversion, if the cold junction temperature is at -20^oC.	L3	05
OR				
Q. 06	a	Discuss Seebeck effect, and Peltier effect with their coefficients.	L2	08
	b	Explain the construction and working of thermo couples. Mention their advantages	L2	07
	c	EMF of a thermocouple is $1200\mu V$, when working between 0^oC and 100^oC . Its neutral temperature is 300^oC. Find the values of *a* and *b* for it.	L3	05
Module-4				
Q. 07	a	Explain the construction and working of Porous Plug experiment with neat diagram	L2	08
	b	Explain the Liquefaction of Helium	L2	08
	c	In Joule Thomson experiment temperature changes from 100^0 C to 150^0 C for pressure change of 20 Mpa to 170 Mpa. Calculate Joule Thomson coefficient.	L3	04
OR				
Q. 08	a	Describe the Lindey's air liquefier.	L2	08
	b	Explain briefly the applications of cryogenics in food processing and aerospace	L2	08
	7	Describe Joule-Thomson effect.	L3	04
Module-5				
Q. 09	a	Describe the construction and working of X-ray photoelectron spectroscopy.	L2	08
	b	Describe the construction & working of transmission electron microscope (TEM).	L2	08
	c	X-rays are diffracted in the first order from a crystal with d spacing 2.8 Å at a glancing angle 60°. Calculate the wavelength of X-rays.	L3	04
OR				
Q. 10	a	Describe the construction and working of Scanning Electron Microscope (SEM) .	L2	09
	b	Define nano-material and nano composite and classify the nano-materials based on the dimensional constraints.	L2	06
	c	Determine the crystallite size given the Wavelength of X-rays 10 nm , the Peak Width 0.5 °and peak position 25 ° for a cubic crystal given K = 0.94.	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	1,2,12
	(c)	L3	1	1,2
Q.2	(a)	L2	1	1,2,12
	(b)	L2	1	1,2,12
	(c)	L3	1	1,2
Q.3	(a)	L2	1	1,2
	(b)	L2	1	1,2,12
	(c)	L3	1	1,2
Q.4	(a)	L2	1	1,2,12
	(b)	L2	1	1,2,12
	(c)	L3	1	1,2,12
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