USN										

FIRST Semester B. E. Degree Semester End Examination (SEE), Jan/ Feb 2024

Physics of Material Designing

(Model Question Paper - 1)

[Time: 3 Hours] **[Maximum Marks: 100]**

Instructions to students:

i. **Answer FIVE FULL Questions as per choice.**
ii. **Use BLACK ball point pen for text, figure, table, etc.**
iii. **Assume missing data, if any.**

		Module-1	Marks	CO	RBT Level
1.	**a)**	Explain damped Oscillations and establish the general solution for the damped oscillations.	**[08 Marks]**	**CO1**	**L2**
	b)	Derive the expressions for equivalent force constants for 2 springs in series and parallel also mention the expression for period of its oscillations.	**[07 Marks]**	**CO1**	**L2**
	c)	A Mass of 5 kg is suspended from the free end of a spring when set for vertical oscillations, The system executes 100 oscillations in 40 seconds. Calculate the force constant of the spring	**[05 Marks]**	**CO1**	**L3**
		OR			
2.	**a)**	Explain forced oscillations and give the theory of forced vibrations and deduce the expression for amplitude of forced vibration.	**[08 Marks]**	**CO1**	**L3**
	b)	With necessary diagram explain construction and working of Reddy shock Tube and mention any four applications	**[07 Marks]**	**CO1**	**L2**
	c)	The distance between two pressure sensors in a shock tube is 100mm. The time taken by a shock wave to travel this distance is 200μs. If the velocity of sound under the same conditions is 340m/s. find the Mach number of the shock wave.	**[05 Marks]**	**CO1**	**L3**
		Module-2			
3.	**a)**	Explain Poisson's Ratio and its limit, Derive the relation between Bulk Modulus, Young's Modulus and Poisson's ratio.	[08 Marks]	CO 1	L2
	b)	State Hooke's law and explain the nature of elasticity with the help of stress – strain diagram	[07 Marks]	CO 1	L1
	c)	A metal cube of side 0.20 m is subjected to a shearing force of 4000 N. The top surface is displaced through 0.50 cm with respect to the bottom. Calculate the shear modulus of elasticity of the metal.	[05 Marks]	CO 1	L3
		OR			
4.	**a)**	Define Bending Moment and derive an expression for bending moment with the help of a neat sketch.	[08 Marks]	CO 1	L2
	b)	Explain Neutral surface, Neutral plane, Beam and its type	[07 Marks]	CO 1	L1
	c)	A solid lead sphere of radius 10 meter is subjected to a normal pressure of 10 Pa acting all over the surface. Determine the change in its volume.	[05 Marks]	CO 1	L3
		Module-3			

5.	**a)**	Define spontaneous emission and stimulated emission. Derive the expression for energy density of radiation at equilibrium in terms of Einstein's coefficients.	**[08 Marks]**	**CO2**	**L2**
	b)	Describe different types of optical fibers with neat diagrams	**[07 Marks]**	**CO2**	**L1**
	c)	Find the attenuation in an optical fiber of length 500m when alight signal of power 100mW emerges out of the fiber with a power of 90mW.	**[05 Marks]**	**CO2**	**L3**
		OR			
6.	**a)**	Define numerical aperture and derive the expression for numerical aperture of an optical fiber and mention the condition for ray propagation in optical fiber.	**[08 Marks]**	**CO2**	**L3**
	b)	Explain the construction and working of a semiconductor Laser	**[07 Marks]**	**CO2**	**L2**
	c)	The average output power of laser source emitting a laser beam of wavelength 632.8nm. Find the number of photons emitted per second by the laser source	**[05 Marks]**	**CO2**	**L3**
		Module-4			
7.	**a)**	Discuss the Factors affecting acoustics of buildings and remedial measures.	[08 Marks]	CO3	L3
	b)	Explain Cosine law and inverse square law.	[07 Marks]	CO3	L1
	c)	The reverberation time is found to be 1.5 second for an empty hall and it is found to be 1 second when a curtain cloth of 20m2 is suspended at the center of the hall. If the dimensions of the hall are 10 x 8 x 6 m3 calculate the coefficient of absorption of the curtain cloth.	[05 Marks]	CO3	L3
		OR			
8.	**a)**	Define Photometry and explain photometric quantities.	[08 Marks]	CO3	L1
	b)	Elucidate the Impact of Noise in Multi-storied buildings.	[07 Marks]	CO3	L2
	c)	For an empty assembly hall of size 20 x15 x 10 cubic meter with absorption coefficient 0.106. Calculate reverberation time.	[05 Marks]	CO3	L3
		Module-5			
9.	**a)**	Explain construction and working of SEM	[08 Marks]	CO4	L5
	b)	Explain composite materials and its classification also mention any 4 applications	[07 Marks]	CO4	L3
	c)	Explain experimental determination of wavelength using diffraction grating experiment	[05 Marks]	CO5	L2
		OR			
10.	**a)**	Explain construction and working of TEM	[08 Marks]	CO4	L2
	b)	Describe the synthesis of carbon nanotubes by Arc discharge method	[07 Marks]	CO4	L2
	c)	In an optical fibre experiment the Laser light propagating through optical fibre cable of 1.5m, made a spot diameter of 8mm on the screen. The distance between the end of the optical fibre cable and the screen is 0.031 m. calculate angle of contact and numerical aperture of given optical fibre	[05 Marks]	CO5	L3

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