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

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

First/Second Semester B.E. Degree Examination

Applied Physics for Civil Engineering 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 $\times 10^{8}$ ms^{-1}, Boltzmann Constant 'k' = 1.38 $\times 10^{-23}$ JK^{-1}, Planck's Constant 'h' = 6.625 $\times 10^{-34}$ Js, Acceleration due to gravity 'g'= 9.8 ms^{-2}, Permittivity of free space 'ε_0'=8.854 $\times 10^{-12}$ F m^{-1}.

		Module -1	*Bloom's Taxonomy Level	Marks
Q.01	a	Classify the waves based on mach number and Mention any five applications of Shock Waves.	L2	9
	b	Describe the applications of damped oscillations in automatic door closures and automobile suspension springs.	L2	6
	c	Calculate the resonance amplitude of the vibration of the system whose natural frequency is 1000 Hz when it oscillates in the resistive medium for which the value of damping per unit mass is 0.008 rad/s under the action of an external periodic force/unit mass of amplitude 5 N/kg, with tunable frequency.	L3	5
		OR		
Q.02	a	Explain the types of springs and their applications.	L2	6
	b	Setup the differential equation for Forced oscillations and assuming the equations of amplitude and phase discuss the dependence of amplitude on the frequency of the applied external periodic force.	L2	9
	c	Calculate the mach angle if the object is traveling with a speed of 660 ms^{-1} given the speed of sound in the medium is 330 ms^{-1}.	L3	5
		Module-2		
Q.03	a	Definition, a brief discussion on factors affecting fatigue such as surface effect, design effect and environmental effects.	L2	9
	b	Explain elongation, compression strain and Poisson's ration and also arrive at the relation between them.	L2	6
	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.	L3	5
		OR		
Q.04	a	Discuss the brittle and ductile fractures.	L2	6
	b	Define Bending Moment and derive an expression for bending moment with the help of a neat sketch.	L2	9
	c	Calculate the force required to produce an extension of 1 mm in wire made of material with Young's Modulus 100 Gpa and of length 1 m and diameter 1 mm.	L3	5
		Module-3		
Q.05	a	Give the qualitative explanation of radiometric quantities such as Radiant energy, radiant power, radiant intensity, radiance, radiant exitance etc along with respective equations.	L2	10
	b	Describe Reflectance and transmittance.	L2	5
	c	Explain the impact of noise in Multi-storied buildings.	L2	5

		OR		
Q.06	a	Discuss the Factors affecting acoustics of buildings and remedial measures.	L2	10
	b	Explain Cosine law and inverse square law.	L2	5
	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.	L3	5
		Module-4		
Q.07	a	Discuss the interaction of radiation with matter and hence explain Laser Action.	L2	9
	b	Discuss the construction and working of optical fiber displacement sensor.	L2	6
	c	In a LASER system when the energy difference between two energy levels is 2×10^{-19} J, the average power output of LASER beam is found to be 4 mW. Calculate number of photons emitted per second.	L3	5
		OR		
Q.08	a	Give brief description of application of LASER in Road Profiling, Bridge Deflection and Speed Checker.	L2	6
	b	Define attenuation in fiber with the expression for attenuation coefficient and describe the various fiber losses.	L2	8
	c	Calculate the Numerical aperture and acceptance angle for an optical fiber of RI of core 1.5 and RI of cladding 1.45 placed in water of RI 1.33.	L3	5
		Module-5		
Q.09	a	Discuss the classification of Earthquakes.	L2	9
	b	Enumerate the the causes and adverse effects of tsunami waves.	L2	6
	c	Calculate the intensity of earthquake of magnitude 6.5 assuming the base intensity as I_0	L3	5
		OR		
Q.10	a	Define Landslide and describe the causes for landslides.	L2	8
	b	Discuss the Engineering structures to withstand earthquakes and Tsunami waves.	L2	7
	c	The intensity of one earthquake is 100 times the intensity of the other. If the magnitude of the first earthquake is 8.9 estimate the magnitude of the other .	L3	5

*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
	(b)	L2	1	1,2,12
	(c)	L3	1	1,2
Q.2	(a)	L2	1	1,2,12
	(b)	L2	1	1,2
	(c)	L3	1	1,2
Q.3	(a)	L2	1	1,2,12
	(b)	L2	1	1,2
	(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)	L2	2	1,2,12
Q.6	(a)	L2	2	1,2,12
	(b)	L2	2	1,2,12
	(c)	L2	2	1,2,12
Q.7	(a)	L2	3	1,2,12
	(b)	L2	3	1,2
	(c)	L3	3	1,2
Q.8	(a)	L2	3	1,2,12
	(b)	L2	3	1,2,
	(c)	L3	3	1,2
Q.9	(a)	L3	4	1,2,6,12
	(b)	L2	4	1,2,6,12
	(c)	L3	4	1,2
Q.10	(a)	L2	4	1,2,6,12
	(b)	L2	4	1,2,6,12
	(c)	L3	4	1,2

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		Module -1	*Bloom's Taxonomy Level	Marks
Q.01	a	Define Stiffness factor of a spring and hence derive expressions for the effective spring constant of springs in series and parallel combinations.	L2	7
	b	Explain various forces acting on a system under damped oscillations, setup differential equation and assuming the solution mention the variation of amplitude with respect to time.	L2	8
	c	An object travels a distance of 1km in 2s. Given the speed of sound in air 340 ms^{-1} calculate the mach number.	L3	5
		OR		
Q.02	a	Mention the various mach regimes and Explain the construction and working of Reddy Shock Tube with the help of neat sketch.	L2	9
	b	Define resonance and discuss the sharpness of resonance.	L2	6
	c	Evaluate the resonance frequency of a spring of force constant 2467 Nm^{-1}, carrying a mass of 100gm.	L3	5
		Module-2		
Q.03	a	Mention the types of engineering materials and describe the failures in engineering materials.	L2	9
	b	Define a Beam and classify the types of beams.	L2	6
	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.	L3	5
		OR		
Q.04	a	Describe stress hardening and stress softening.	L2	6
	b	Define Poisson's ration and derive the relation between Young's Modulus, Rigidity Modulus and Poisson's ratio.	L2	9
	c	Consider a steel wire of radius 0.13 mm and length 2m. If the wire is rigidly fixed at one and loaded at the other with a mass of 1.5 kg the extension observed is 2 mm. Calculate the Young's Modulus of the material of the wire.	L3	5
		Module-3		
Q.05	a	Define Photometry and explain photometric quantities.	L2	10
	b	Elucidate the Impact of Noise in Multi-storied buildings.	L2	5
	c	For an empty assembly hall of size 20 x15 x 10 cubic meter with absorption coefficient 0.106. Calculate reverberation time.	L2	5
		OR		
Q.06	a	Define reverberation and reverberation time and hence derive Sabines Formula.	L2	10
	b	Mention the conditions for good acoustics.	L2	5
	c	Define the five spectral quantities.	L2	5

Module-4				
Q.07	a	Discuss the construction and working of laser in LASER range finder and its application in defense.	L2	8
	b	Define Numerical Aperture and hence derive an expression for numerical aperture in terms of the RIs of core, cladding and the Surrounding.	L2	7
	c	Calculate the number of photons emitted per second for a LASER with power output 10mW given the wave length of fiber 690 nanometer.	L3	5
OR				
Q.08	a	Explain the construction and working of fiber optic temperature sensor.	L2	6
	b	Enumerate the requisites of a laser system and Describe the construction and working of Semiconductor Laser with a neat sketch and energy level diagram.	L2	9
	c	Calculate the attenuation coefficient for a fiber of length 2 km given the input and output optical power of the fiber 90 mW and 60 mW.	L3	5
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Q.09	a	Discuss the classification of Earthquakes.	L2	8
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