Model Question Paper

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Course Code: 1BPHYC102

First Semester B.E. Degree Examination, January 2026
Physics for Sustainable Structural Systems (CV Stream)

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

Note: 1. Answer any FIVE full questions, choosing ONE question from each MODULE
2. VTU Formula Hand Books Permitted
3. M: Marks, L: Bloom's level,C: Course outcomes.

		Module - I	M	L	C
Q.01	a	Define Stiffness factor of a spring and hence derive an expression for the effective spring constant of springs in series and Parallel combinations.	07	L2	CO1
	b	Setup the differential equation for damped oscillations. Explain overdamping, critical damping and under damping by graph.	08	L2	CO1
	c	A body of mass 500 gm is attached to a spring and the system is driven by an external periodic force of amplitude 15 N, and frequency 0.796 Hz. The spring extends by a length of 88 mm under the given load. Calculate the amplitude of oscillation, if the resistance coefficient of the medium is 5.05 kg/s. Ignore the mass of the spring.	05	L3	CO1
		OR			
Q.02	a	Explain various forces acting on a system under forced vibration and discuss the three cases	09	L2	CO1
	b	Define resonance? Discuss the sharpness of resonance.	06	L2	CO1
	c	A vibrating system of natural frequency 500 cycles/second, is forced to vibrate with a periodic force/unit mass of amplitude 100 x 10^{-5} N/kg in the presence of a damping/unit mass of 0.01x10^{-3} rad/s. Calculate the maximum amplitude of vibration of the system.	05	L3	CO1
		Module - II			
Q.03	a	Enumerate the causes and adverse effects of tsunami waves.	07	L2	CO2
	b	Mention the types of waves. Explain wave propagation in beams, rods, and slabs.	08	L2	CO2
	c	The intensity of one earthquake is 100 times the intensity of the other. If the magnitude of the first earthquake is 8.0 estimate the magnitude of the other .	05	L3	CO2
		OR			
Q.04	a	Define ground motion and list its key parameters? Explain the structural response and soil-structure interaction.	08	L2	CO2
	b	Discuss the Engineering structures to withstand earthquakes and Tsunami waves.	07	L2	CO2
	c	Calculate the intensity of earthquake of magnitude 6.0 assuming the base intensity as I_0.	05	L3	CO2
		Module - III			
Q.05	a	Discuss the factors affecting acoustics of buildings and remedial measures.	09	L2	CO3
	b	Elucidate the impact of noise in multi-storied buildings.	06	L2	CO3

	c	A Lambertian surface has luminous intensity $I(0^o)=50.0$ cd in the normal direction. Using Lambert's cosine law, what is the luminous intensity at $\theta=60^o$? What fraction of the normal intensity is this?	05	L3	CO3
OR					
Q.06	a	Define Photometry? Explain Photometric quantities	08	L2	CO3
	b	Discuss the measurement of absorption coefficient of absorbing materials using Sabine's formula.	07	L2	CO3
	c	The volume of an auditorium is 12000 m^3. Its reverberation time is 1.5 second. If the average absorption coefficient of interior surfaces is 0.4 Sabine m^{-2}. Find the area of interior surfaces.	05	L3	CO3
Module - IV					
Q.07	a	Describe the principle process and qualitative considerations of Liquid Penetration Test.	07	L2	CO4
	b	Describe the generation of ultrasonic and its role of probes. Mention the types of probes.	08	L2	CO4
	c	Speed of sound in a steel block is 5900 m/s. The observed Front-wall echo is at 2 μs and back-wall echo at 26 μs. Find the thickness of the specimen.	05	L3	CO4
OR					
Q.08	a	Describe the inspection probes and display methods in eddy current testing.	08	L2	CO4
	b	Discuss the the shadow formation and distortion in radiography.	07	L2	CO4
	c	The mass attenuation coefficient of steel is $\mu/\rho=0.00500$ m^2/kg, and the steel density is $\rho=7850$ kg/m^3. Given the plate thickness $x=0.012$ m calculate the transmitted fraction of radiation I/I_0.	05	L3	CO4
Module - V					
Q.09	a	Explain the qualitative discussion on types of smart materials.	08	L2	CO5
	b	Describe the concept of structural health monitoring.	07	L2	CO5
	c	A metallic strain gauge has nominal resistance $R=120.0\ \Omega$ and a gauge factor $GF=2.05$. If the specimen strain is $\varepsilon=600\ \mu\varepsilon$, calculate the expected change in resistance ΔR (in ohms).	05	L3	CO5
OR					
Q.10	a	Deduce the classification of sensors? Explain the working of temperature sensors and mention its advantages.	07	L2	CO5
	b	Describe the principle of piezoelectric materials and Explain the working and principle of sensors technology.	08	L2	CO5
	c	A piezoelectric disk has a charge coefficient $d=200\times10^{-12}$ CN^{-1} under an applied compressive force $F=50.0$ N. If the disk is connected to an input stage with an effective capacitance $C=50.0$ pF, compute the open-circuit voltage V in millivolts (mV).	05	L3	CO5

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