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Thapar Institute of Engineering & Technology, Patiala
School of Physics & Materials Science
MID SEMESTER EXAMINATION

B. E. (II-Semester) 2019-20	Course Code: UPH004
6th March, 2020	Course Name: Applied Physics
Time: 2 Hours, Max. Marks: 50	Name of Faculty: ALK, DPS, PUL, DBD, RKR, DKS, PPS

Note: Answer all the questions. All the symbols have their usual meanings. Use suitable symbols wherever required.

Q1.	(a) Derive the differential equation which describes the charge on the capacitor of an LCR circuit. Explain the conditions for underdamped, overdamped and critically damped oscillations of charge on the capacitor with the help of suitable diagrams.	4+4
	(b) A ball of mass 25g hangs at the end of a spring. When another ball of mass 10g is attached to the end of the spring, it stretches 2.5 cm more. Calculate the period of the simple harmonic oscillation if the ball of mass 10g is removed.	4
Q2.	(a) Describe the conditions of an acoustically good hall on the following criteria: (i) loudness (ii) reverberation, (iii) intensity and (iv) noise.	6
	(b) When the window of a hall is open, the reverberation time is 1.25s. If the window is closed completely, the reverberation time increases to 1.29s. The dimension of the hall is 25m × 20m ×10m. If the surface area of the window is $24m^2$, find the absorption coefficient of the material used in the window.	4
	(c) "Logarithmic decrement is dependent on the relaxation time for a damped oscillator". Is the statement true? Justify.	2
Q3.	(a) Describe the construction and working of an oscillatory circuit used to generate ultrasonic waves based on the principle of magnetostriction.	4+4
	(b) Calculate the natural oscillation frequency of 100 mm long iron rod. Density and Young's modulus of iron are $7.25g/cm^3$ and $1.15 \times 10^{11} N/m^2$ respectively. Can it be used to produce ultrasonic wave?	4
Q4.	(a) Write down the Maxwell's equations in differential form for free space. Hence, prove that the EM waves propagate with the speed of light in free space.	4+3
	(b) Calculate the divergence of the vector field $\vec{F} = xyz\,\hat{\imath} + yz\,\hat{\jmath} + z\,\hat{k}$	4
	(c) "Time varying electric field generates magnetic field". Is the statement true? Justify.	3