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Thapar Institute of Engineering and Technology, Patiala

School of Physics & Materials Science

MID SEMESTER EXAMINATION

B. E. (First Year): Semester-I (2017-18)	Course Code: UPH004 Course Name: Applied Physics
12th March , 2018	Day: Monday
Time: 2 Hours, M. Marks: 50	Name Of Faculty: **AKU, SDT, DPS, SOJ, PUL, DBD, RKR,GDV,MUK**

Note: Attempt all questions in sequence. Assume missing data, if any, suitably. Symbols have their usual meaning.

Q.1(a) Develop the differential equation of motion for an LCR circuit. Also plot the time varying behaviour of the charge in different conditions of damping. (5)

Q.1(b) A particle executing S.H.M. along a straight line has a velocity of 4m/sec, when at a distance of 3m from its mean position and 3m/sec, when at a distance of 4m from it. Find the time it takes to travel 2.5m from the positive extremity of its oscillation. (5)

Q.1(c) Is the statement true or false? Justify with reasoning, "A particle of mass m is hanging vertically by an ideal spring of force constant *K*, if the mass is made to oscillate vertically, its total energy is maximum at extreme positions". (3)

Q.2 (a) You are given two sound sources with power outputs P_0 and P_0' with their maximum intensities I_0 and I_0' respectively. Develop a method to calculate the average absorption coefficient for a given reverberation chamber hall using the sources. (5)

Q.2 (b) The volume of a hall is 2265m^3 and its absorption is 92.9m^2 of open window. If the hall is occupied with audience, the absorption gets doubled. Find the reverberation time when the hall is full with audience. How much surface area of cushioned chairs with absorption coefficient 0.4 can have the similar absorption as that of audience. (5)

Q.2 (c) A damped harmonic oscillator has the first amplitude 16cm and this reduces to 1 cm after 100 oscillations. If the period of oscillation is 6.9 s, calculate the logarithmic decrement. (3)

P.T.O.

Q.3 (a) How will you design a circuit using a quartz crystal for producing the ultrasonic waves? Explain its working. (5)

Q.3 (b) We want to generate an ultrasonic wave of frequency ' f ' by both the popular methods, that is piezoelectric and magnetostriction method. What should be the length of nickel rod used in magnetostriction method, in terms of thickness of the quartz crystal used in piezoelectric method? Given Young's modulus of nickel=$2.14\times10^{11}N/m^2$, Density of nickel rod=8908 kg/m^3 Young's modulus of quartz crystal=$7.9\times10^{10}N/m^2$, Density of quartz crystal=$2650kg/m^3$. (4)

Q.3 (c) Is the statement true or false? Justify with reasoning "Kundt's tube is used for the detection of ultrasonic waves". (3)

Q.4 (a) Derive the electromagnetic wave equations in a conducting medium. Mention the importance of frequency in skin depth for a good conductor. (5)

Q.4 (b) Find the curl of the following vector field $\overline{F}$ and comment on the result. (4)

$$\overline{F} = yz^2\,\hat{i} + (xz^2+2)\,\hat{j} + (2xyz-1)\,\hat{k}$$

Q.4 (c) Show that for free space, at any instant of time, the value of electric field vector is 377 times the magnetic field vector. (3)

Notice for showing evaluated answer sheets will be displayed on UPH 004 website.