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Total Number of Pages: 02
(OLD)

B.Tech
BS1102

2nd Semester Back Examination 2016-17

PHYSICS- I

BRANCH(S): ALL

Time: 3 Hours

Max Marks: 70

Q.CODE: Z928

**Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.**

Q1 Answer the following questions: (2 x 10)

- a) Two simple pendulum of mass 'm' and length 'l' each, are coupled by a spring of force constant 'k'. write the expression for frequency of normal modes of vibration of the coupled system.
- b) Write down the condition for clear vision of interference fringes.
- c) Why diffraction cannot occur if slit width is less than the wavelength of light?
- d) The refractive index of glass is 1.54. Find the polarising angle when light passes from glass to air medium.
- e) Define divergence of a vector function in terms of integrals.
- f) What is the physical significance of curl of a vector field?
- g) Distinguish between conduction current and displacement current.
- h) What is black body radiation?
- i) Write the time independent Schrodinger 's equation for a free particle of mass 'm' moving in xy-plane.
- j) The particle trapped in a one dimensional box of length 1 cm is described by the normalized wave function $\Psi=x$. what is the expectation value of the particle.

Q2

- a) Graphically show the displacement-time curves for under-damped, over-damped and critically damped motions. Derive an expression for the amplitude of an under damped harmonic oscillator during nth number oscillation. **(6)**
- b) Two simple harmonic oscillators of mass 10gm and 800gm oscillate separately under the action of same restoring force. Calculate the ratio of their frequencies. **(4)**

Q3

- a) Mention the conditions for production of a sustained interference pattern. With the help of a suitable ray diagram, describe the production of Newton's rings. (5)
- b) Describe with necessary equation, how you will determine refractive index of water by using Newton's wring apparatus. (5)

Q4

- a) Describe the formation of diffraction pattern due to plane diffraction grating . What particular spectra would be absent if the width of the transparencies and opacities of the grating are equal ? (5)
- b) Explain Brewster's law. A light is incident on a partially transparent medium at polarizing angle. Show that the reflected and transmitted rays are mutually perpendicular to each other. (5)

Q5

- a) Explain the construction and working of a Nichol's prism with a suitable diagram. (5)
- b) Distinguish between unpolarized, plane polarized, circularly polarized and elliptically polarized light. (5)

Q6

- a) Derive Ampere's circuital law and make necessary modification to get Maxwell's 4th equation. (6)
- b) Define Gauss' divergence theorem. Using Gauss' divergence theorem prove the volume of the sphere is $\frac{4}{3}\pi r^3$. (4)

Q7

- a) Derive the equation for an electromagnetic wave travelling in a charge free conducting medium in terms of electric field vectors. (5)
- b) Discus about uncertainty principle. Using Heisenberg's uncertainty principle prove that the minimum energy of the one dimensional harmonic oscillator can not be zero. (5)

Q8

- a) Derive time independent and time dependent Schrodinger equation. Using Schrodinger equation find the solution for potential barrier. (6)
- b) A particle is confined to move along a line of length 'L' cm. Find the expectation value of the particle's position $\langle x \rangle$, if its normalized wave function is given by

$$\psi = \sqrt{\frac{2}{L}} \sin \frac{n\pi x}{L}.$$