Total number of printed pages–4

53 (PH 101) ENPH

2021

ENGINEERING PHYSICS

Paper : PH 101

Full Marks : 100

Time : Three hours

***The figures in the margin indicate
full marks for the questions.***

*Answer **any five** questions.*

1. (a) Write the physical interpretation of the gradient of a scalar function. 5

   (b) State and explain Stokes' theorem. 5

   (c) Determine, if the vector field

   $$\vec{F} = yz^2\,\hat{i} + \left(xz^2 + 2\right)\hat{j} + \left(2xyz - 1\right)\hat{k}$$
   is conservative. 5

   (d) Compute *div* $\vec{F}$.

   $$\vec{F} = x^2 y\,\hat{i} - \left(z^3 - 3x\right)\hat{j} + 4y^2\,\hat{k}.$$ 5

2. (a) What is displacement current ? 2

   (b) Write Maxwell's equations in differential and integral form. 4+4=8

   (c) Define the efficiency of a heat engine. 2

   (d) Write the working of Carnot Engine. 8

3. (a) State Stefan-Boltzmann's law of heat radiation. 3

   (b) Draw and explain the energy distribution curves for Black-body radiation. 7

   (c) State 1st and 2nd law of thermodynamics. Then discuss the limitations of 1st law of thermodynamics. 10

4. (a) What is Photoelectric effect ? 4

   (b) Write the Einstein Equation of Photoelectric effect. 4

   (c) What do you mean by threshold frequency and work function ? 4

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(d) Write the value of Planck's constant (h). 2

(e) What is photon? 2

(f) Determine the kinetic energy of a photoelectron emitted from the surface of a metal when light of wavelength $6.2 \times 10^{-6}\ m$ incident on the surface of work function 0.1 eV. 4

5. (a) Write the Schrödinger time dependent and time independent equations. 10

(b) Write the application of Schrödinger equation for free particle in one-dimensional infinite potential box. 10

6. (a) What are the processes associated with LASER radiation? 10

(b) Write the different applications of LASER. Mention different types of LASER. 10
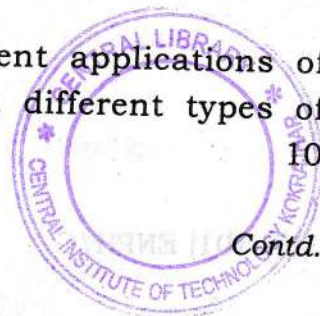
7. (a) Write down the differential equation for simple harmonic oscillation and find its general solution for displacement.   5

(b) Write the differences between damped vibration and forced vibration.   5

(c) Define resonance and quality factor.   5

(d) A body of mass 'm' vibrating SHM, whose displacement equation is given by, $x = A_0 \cos \omega_0 t$.

Find the position where potential energy is same as kinetic energy.   5