

Total number of printed pages-5

53 (PH 101) ENPH

2019

**ENGINEERING PHYSICS**

Paper : PH 101

Full Marks : 100

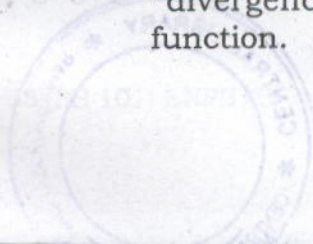
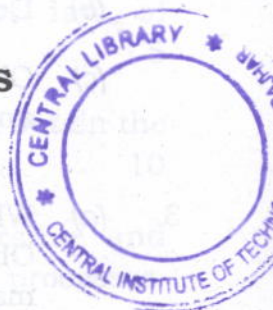
Time : Three hours

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

Answer **any five** questions.

1. (a) State and explain Stokes' theorem 5
- (b) Evaluate the integral  $\int \int_S (3x\hat{i} + 2y\hat{j}) \cdot d\vec{a}$ , where 'S' is the sphere given by the equation  $x^2 + y^2 + z^2 = 9$  by using divergence theorem. 5
- (c) Find the curl of  $\vec{F} = x^2\hat{i} + 2z\hat{j} - y\hat{k}$ . 5
- (d) Write the physical interpretation of "divergence" and "curl" of a vector function. 5

Contd.



2. (a) Establish the relation between the elastic constants by clearly defining them. 9+3=12
- (b) Derive Bernoulli's equation. 6
- (c) Obtain the relation between torque and angular momentum. 2
3. (a) What do you mean by interference? Obtain the conditions for minima and maxima. Plot the intensity distribution pattern. 2+6+2=10
- (b) Set up the differential equation for forced vibration. Obtain its solution and discuss amplitude resonance. 10
4. (a) What is Chromatic aberration? Explain its cause and remedy. 5
- (b) Differentiate between mechanical and electromagnetic wave with suitable examples. 3+2=5
- (c) Write the differential equation for damped vibration. Write the conditions for under, over and critically damped vibrations. 2+3=5



(d) Establish progressive wave equation in differential form. 5

5. (a) State and explain First law of thermodynamics. 5

(b) Explain Carnot's engine and obtain the expression for its efficiency. 10

(c) Distinguish between reversible and irreversible thermodynamic processes. 3

(d) State Carnot's theorem. 2

6. (a) Derive an expression for amplitude and phase difference for a linear combination of two simple harmonic motions in same direction having the same frequency. 10

(b) Two functions represented by  $X = \cos t$  and  $Y = \sin 2t$ . Draw the Lissajous figure of the function. 10

7. (a) (i) State Gauss' law in electrostatics 3



- (b) Discuss the ferromagnetic materials with examples. Define the Curie temperature and Curie-Weiss Law for a ferromagnetic materials. 6
- (c) What is Biot-Savart law? Calculate the magnetic field along the axis of a circular coil. 4
- (d) Write down the differences between spontaneous and stimulated emission. 3



(ii) Write Poisson's and Laplace's equation in cylindrical and spherical coordinates. 4

(b) Apply Gauss' law to calculate the electric field intensity due to a uniform infinite cylindrical charge at

(i) points lies outside the charge distribution

(ii) the surface of the charge distribution

(iii) points lies inside the charge distribution. 7

(c) A thin spherical shell of metal has a radius of  $0.25m$  and carries a charge of  $0.2 \times 10^{-6}C$ . Calculate the electric field intensity at a point

(i) inside the shell

(ii) outside the shell

(iii)  $3m$  from the center of the shell. 6

8. (a) Show that the electromagnetic wave is transverse in nature. Calculate the velocity of the electromagnetic wave propagation through free space. 7

