Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[5056]-12

F.E. EXAMINATION, 2016

ENGINEERING PHYSICS

(2015 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Figures to the right indicate full marks.

(*ii*) Assume suitable data, if necessary.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Use of Non-Programmable calculator is allowed.

Physical Constants :

Avogadro's number = 6.023×10^{23} gms/mole

Charge on electron (e) = 1.6×10^{-19} C

Planck's constant (h) = 6.63×10^{-34} J-sec.

Mass of electron (m_e) = 9.1×10^{-31} kg.

Velocity of light (c) = 3×10^{8} m/sec.

1. (*a*) Derive expression for path difference in reflected light and derive the conditions for constructive and destructive interference for a film of uniform thickness. [6]

(*b*) Explain any *one* application of ultrasonic waves. [3]

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(*c*) The average reverberation time of a hall is 1.5 sec and the area of the interior surface is 3340 m^2. If the volume of the hall is 13000 m^3, find the absorption coefficient. [3]

Or

2. (*a*) Explain magneto-striction effect. Explain how magneto-striction oscillator is used to produce ultrasonic waves with the help of neat circuit diagram. [6]

(*b*) Explain an application of interference Antireflection coating. [3]

(*c*) A plane transmission grating has 5000 lines/cm. Find out the highest order spectrum observed if incident light has $\lambda = 6000$ Å. [3]

3. (*a*) What is Double refraction ? Explain Huygens's theory of double refraction. [6]

(*b*) What is Holography ? Explain the process of hologram recording. [3]

(*c*) Calculate the mobility of charge carriers in doped silicon whose conductivity is 100/Ω-m and the Hall coefficient is 3.6×10^{-4} m^3/C. [3]

Or

4. (*a*) Derive an expression for conductivity in intrinsic and extrinsic Semiconductors. [6]

(*b*) Define the following : [3]

(1) Stimulated Emission

(2) Meta-stable state

(3) Pumping.

(*c*) Plane polarized light passes through a positive double refracting crystal of thickness 40 μm and emerges out as circularly polarized light. If the birefringence of the crystal is 4×10^{-5}, find the wavelength of the incident light. [3]

5. (*a*) Derive an expression for energy of a particle trapped in an infinite potential well. [6]

(*b*) Define phase velocity and group velocity. Derive the relation between them. [4]

(*c*) An electron beam is accelerated from rest through a potential difference of 200 V. Calculate the associated wavelength. [3]

Or

6. (*a*) What is De-Broglie's hypothesis of matter waves. Show that the De-Broglie's wavelength of a charged particle is inversely proportional to the square root of the accelerating potential. [6]

(*b*) Write down the conditions which are to be satisfied by well behaved wave function. [4]

(*c*) Calculate the energy required to excite the electron from its ground state to fourth excited state in a rigid box of length 0.1 nm. [3]

7. (*a*) What is superconductivity ? Explain the Meissner effect in superconductors. [6]

(*b*) Explain the following properties of Nano-particles : [4]

(*i*) Magnetic property

(*ii*) Mechanical property.

(*c*) Explain the applications of nano particles in medical and automobile field. [3]

Or

8. (*a*) Explain the synthesis of Nano particles by using mechanical method. [6]

(*b*) Explain zero electrical resistance property and isotope effect in superconductor. [4]

(*c*) Explain any *one* application of superconductors in brief. [3]