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

Seat No.	

[5151]-104

F.E. (I Semester) EXAMINATION, 2017
ENGINEERING PHYSICS
(2015 PATTERN)

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

N.B. :— (*i*) Neat diagrams must be drawn wherever necessary.
(*ii*) Figures to the right indicate full marks.
(*iii*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
(*iv*) Assume suitable data, if necessary.

Constants :—(1) Mass of electron = 9.1×10^{-31} kg.
(2) Charge on electron, $e = 1.6 \times 10^{-19}$ C
(3) Mass of proton, $M_p = 1.673 \times 10^{-27}$ kg
(4) Mass of Neutron, $M_n = 1.675 \times 10^{-27}$ kg
(5) Planck's constant, $h = 6.63 \times 10^{-34}$ J.s
(6) Velocity of light in vacuum, $c = 3 \times 10^8$ m/s.

1. (*a*) A thin film of uniform thickness is illuminated by a monochromatic light. Derive an expression for path difference for the reflected rays system. Hence obtain the conditions for constructive and destructive interference. [6]

(*b*) What is reverberation time ? Explain any *two* measures to control reverberation time in an auditorium. [3]

(*c*) Calculate the reverberation time for an empty hall of volume 1200 m^3 that has total sound absorption of 450 m^2 sabine. When the hall is completely occupied, total sound absorption is further increased by 450 m^2 sabine. Hence calculate the reverberation time. [3]

P.T.O.

Or

2. (*a*) What is piezoelectric effect ? Draw neat and labelled diagram for piezoelectric oscillator and hence explain its construction and working. [6]

(*b*) What is diffraction of light ? Differentiate between Fresnel and Fraunhoffer diffraction (*two* points). [3]

(*c*) A monochromatic light of wavelength 5500 Å incident normally on a slit of width 2×10^{-4} cm. Calculate the angular position of first and second minimum. [3]

3. (*a*) Why is the combination of Helium and Neon gases chosen in He-Ne laser system ? Explain construction and working of He-Ne laser system with the help of energy level diagram. [6]

(*b*) Define Fermi level for a semiconductor. Draw a neat and labelled diagram showing position of Fermi level in intrinsic semiconductor and in N-type semiconductor. [3]

(*c*) A sample of intrinsic germanimum at room temperature has a carrier concentration 4.41×10^{22} cm^3. Donor impurity is added in the ratio 1 donor atom per 10^8 atoms/cm^3 of germanium. Determine the resistivity of the material thus formed. (Given : μ_e 3800 $cm^2/V.s$) [3]

Or

4. (*a*) What is Hall effect ? Derive the expression for Hall voltage and Hall coefficient. State applications of Hall effect. [6]

(*b*) What is double refraction ? Draw neat and labelled diagram (either for positive or negative crystal) showing propagation of light within a doubly refracting crystal when optic axis is : [3]

(*i*) parallel to crystal surface

(*ii*) perpendicular to crystal surface.

(*c*) Sugar solution is kept in a 20 cm long tube.When plane polarized light is passed through this solution, its plane of polarization is rotated by 10°. If the concentration of sugar solution is 0.07575, calculate the specific rotation of sugar. [3]

5. (*a*) Deduce Schrodinger's time independent wave equation. [6]

(*b*) What is de-Broglie hypothesis. Derive an expression for de-Broglie wavelength for an electron when it is accelerated by potential diffrerence 'V'. [4]

(*c*) Calculate the energy (in eV) with which a proton has to acquire de-Broglie wavelength of 0.1Å. [3]

Or

6. (*a*) State and explain Heisenberg's uncertainty principle. Illustrate the principle by electron diffraction at a single slit. [6]

(*b*) Explain physical significance of wave function ψ and $(\psi)^2$. State the mathematical conditions that wave function ψ should satisfy. [4]

(*c*) A neutron is trapped in an infinite potential well of width 1 Å. Calculate the values of energy and momentum in its ground state. [3]

7. (*a*) Explain critical magnetic field or superconductor. Differentiate between type-I and type-II superconductors (*four* points). [6]

(*b*) With necessary diagram, explain physical method for synthesis of nanoparticles. [4]

(*c*) State applications of nano-particles. Explain any *one* application. [3]

Or

8. (*a*) What is nanotechnology ? Explain optical and electrical properties of nano-particles. [6]

(*b*) Explain Meissner effect and show that supercondcutors exhibit perfect diamagnetism. [4]

(*c*) State applications of superconductors. Explain any *one* application. [3]