

Faculty of Engineering & Technology  
First Semester B.E. (CBS) Examination  
**ENGINEERING PHYSICS**

**Paper-2**

Time—Two Hours]

[Maximum Marks—40

**INSTRUCTIONS TO CANDIDATES**

- (1) All questions carry marks as indicated.
- (2) Solve **FOUR** questions as follows :  
Que. No. - 1 **OR** Que. No. - 2  
Que. No. - 3 **OR** Que. No. - 4  
Que. No. - 5 **OR** Que. No. - 6  
Que. No. - 7 **OR** Que. No. - 8
- (3) Assume suitable data wherever necessary.
- (4) Diagrams should be given wherever necessary.
- (5) Illustrate your answers wherever necessary with the help of neat sketches.
- (6) Use of non-programmable calculator is permitted.

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**List of Constants :**Planck's constant  $h = 6.625 \times 10^{-34} \text{ J.s}$ Mass of electron  $m = 9.11 \times 10^{-31} \text{ Kg}$ Electron charge  $e = 1.602 \times 10^{-19} \text{ C}$ Avogadro's No.  $N_A = 6.023 \times 10^{26} \text{ atoms/Kmole}$ Mass of  $\alpha$  particle  $= 6.64 \times 10^{-27} \text{ Kg}$ Charge of  $\alpha$  particle  $= 3.2 \times 10^{-19} \text{ C.}$ 

1. (a) State the expression for Compton shift. Explain in brief the existence of modified component in Compton scattering. 1+2
  - (b) Prove that a free electron can not absorb a photon. 3
  - (c) Incident radiation of wavelength  $1.087 \text{ \AA}$  is scattered from a scatterer at an angle of  $30^\circ$ . Calculate the wavelength of scattered photon and kinetic energy of recoil electron. rtmnuonline.com 2+2
- OR**
2. (a) Give an account of Davisson and Germer experiment to show the wave like character of a beam of electron. 4
  - (b) Show that deBroglie wavelength for an electron is  $\frac{12.26}{\sqrt{V}}$  where  $V$  is the accelerating potential. 3
  - (c) Calculate the wavelength associated with a stone of mass 50 gms moving with speed of 50 m/s and an electron with kinetic energy of 100 eV. 3
  3. (a) Define (i) Phase velocity (ii) Group velocity. Obtain the relationship between group velocity and phase velocity. Give the significance of the result. 2+3

- (b) Using the following data show that an electron can not exist inside the nucleus. Given : Radius of nucleus =  $10^{-14}$  m. Maximum Kinetic energy of an electron in an atom = 4 meV. 3
- (c) State Heisenberg uncertainty principle. 2

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4. (a) A particle is confined in one dimensional potential well of infinite depth. Use Schrodinger wave equation to obtain energy states of a particle inside the well. 4
- (b) What is physical significance of  $\psi$ ? 3
- (c) Find the lowest three energy of an electron confined to move in a one dimensional box of length  $5\text{\AA}$ . 3
5. (a) Deduce the relation between the interplaner distance  $d$  and Miller indices of the plane of cubic crystal. 4
- (b) Find atomic radius, packing fraction and void space for simple cubic crystal structure. 3
- (c) The density of copper is  $8980 \text{ Kg/m}^3$  and unit cell dimension is  $3.61 \text{\AA}$ . Atomic weight of copper = 63.54. Determine crystal structure and atomic radius. 3

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6. (a) Define - (i) Space lattice  
(ii) Unit cell rtmnuonline.com  
(iii) Coordination Number. 3
- (b) What are Miller Indices? Draw separately the planes (100), (011) and (211) 1+3
- (c) An X-ray beam of wavelength  $1.5 \text{\AA}$  is diffracted by (110) planes of Nickel crystal. The first order diffraction is obtained at an angle of  $27.6^\circ$ . Determine the lattice constant of unit cell of Nickel having FCC structure. 3
7. (a) Explain the formation of depletion region in a p-n Junction diode. rtmnuonline.com 4
- (b) Draw energy band diagram for N-type semiconductor at  $0^\circ\text{K}$  and  $T^\circ\text{K}$ . 3
- (c) Calculate fraction of electron in conduction band of diamond at  $27^\circ\text{C}$ ; if band gap is  $5.6 \text{ eV}$  wide. 3

OR

8. (a) Explain Hall Effect. Obtain an expression for Hall Coefficient. 1+3
- (b) Draw energy band diagram for p-n-p transistor when biased in common base mode and in unbiased mode. rtmnuonline.com 3
- (c) Explain drift current and diffusion current. 3