G 124

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2003.

Second Semester

Chemical Engineering

(Common to Fashion Technology, Industrial Bio Technology, Leather Technology, Polymer Technology, Textile Chemistry, Textile Technology)

PH 134 — PHYSICS II

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

(Given constants (i) Planck's constant = 6.626×10^{-34} Js

(ii) Mass of an electron = 9.1×10^{-31} kg

(iii) Velocity of Light = 3×10^{8} m/s

(iv) Mass of Neutron = 1.674×10^{-27} kg

(v) Avagadro Number = 6.023×10^{26} per kg. mole)

1. Three capacitors 2.0, 3.0, 6.0 micro farad are connected in series to a 10 volt source. What is the charge over the combination of capacitors?

2. Define electric potential.

3. Calculate the first three permitted energy levels of electron in a box of 1 A° wide.

4. Find the change in wavelength of an X ray photon when it is scattered through an angle of 90° by a free electron.

5. What is thermo nuclear reaction?

6. X Rays of wavelength 0.36 A° are diffracted at an angle of 48° in the first order of Bragg's crystal photograph. Find the atomic spacing in the crystal.

7. What do you understand by the packing density of the crystal?

8. What is screw dislocation?

9. What are the defects that can be identified by NDT techniques?

10. What is thermography?

PART B — (5 × 16 = 80 marks)

11. (i) Give an account of non-destructive testing by radiography. (6)

(ii) Describe how opto-acoustical image processing is useful for detection of internal defects of an opaque object. (10)

12. (a) (i) State Gauss Theorem. (2)

(ii) Determine the intensity of electric field at a point outside the charged sphere. (8)

(iii) Find the work done in bringing the charge $+10 \times 10^{-4}$ μC from infinity to a point 0.25 m from a charge of $+3 \times 10^{-2}$ μC. (6)

Or

(b) (i) What is the advantage of Carey Foster's bridge? (2)

(ii) How Carey Foster's bridge is useful in determining the difference between the nearly equal resistance? (8)

(iii) How would you connect four paper capacitors each 1 μF to produce a capacity of 0.25 μF? (6)

13. (a) (i) Explain de-Broglie hypothesis. (3)

(ii) Show how that the wavelength λ associated with an electron of mass m accelerated by a potential of V volts is given by $\lambda = h/\sqrt{2meV}$. (7)

(iii) Find the energy of a neutron whose de-Broglie wavelength is 1 A°. (6)

Or

(b) (i) Derive the time dependant Schrodinger wave equation for a particle. (12)

(ii) Mention the physical interpretation of the wave function ψ. (4)

14. (a) (i) State Pauli's exclusion principle. (2)

(ii) Explain how different quantum numbers are useful in fixing the electronic configuration of the elements in the periodic table. (10)

(iii) Explain Types of spectra. (4)

Or

(b) (i) What is the chain reaction in nuclear fission? (3)

(ii) Explain the nuclear fusion reaction which takes place in suns and stars. (8)

(iii) Mention about power reactor. (5)

15. (a) (i) Show that the packing factor of SC, BCC and FCC are $\pi/6, \frac{\sqrt{3}\pi}{8}$ and $\frac{\sqrt{2}\pi}{6}$ respectively. (10)

(ii) A FCC lattice substance has density 6250 KG/m^3 and the molecular weight 60.2. Calculate the lattice constant. (6)

Or

(b) (i) What are Miller indices? (2)

(ii) How to find the Miller indices of a plane? (5)

(iii) Obtain the relation between interplanar distance and interatomic distance in a cubic crystal. (9)
