Subject: Engineering Physics (Revised)   Code : 59176

First Year Engineering - SEM. – I and II

(New Syllabus : Introduced from July 2013)

Day and Date : Monday, 19-05-2014   Time : 10 a.m. to 1 p.m.

Total Marks: 100

Note: 1. All questions are compulsory.

2. Figures to the right indicate full marks.

Constants :   1. Avogadro's Number N = 6.02 X 10^{26} atoms/Kg atom

2. Planck's constant, h = 6.63 X 10^{-34} Js.

3. Electorn mass, in = 9.1 X 10^{-31} Kg

4. Electron charge, e = 1.6 X 10^{-19} C

5. Light velocity C = 3 X 10^{8} m/sec.

SECTION - I

Q.1. **Attempt any three.**

a) Define resolving power of grating and obtain an expression for it.   06

b) Explain the phenomeon of double refraction and distringuish between positive and negative crystals.   06

c) Define : Optic axis, specific rotation Determine the specific rotation of the given sample of sugar solution if the plane of polarisation is turned through 13.2^{0}. The length of the tube containing 10% sugar solution is 20cm.   05

d) A plane graing has 15000 lines per inch. Find the angle of separation of the $5048A^{0}$ and $50/6 A^{0}$ lines of helium in second order.   05

Q.2. Attempt any three.

a) With neat diagram explain construction and working of ruby laser. 06

b) i) Explain the term : acceptance angle, acceptance cone, Numerical aperture. 03

  ii) Compute the numerical aperture and hence the acceptance angle for an optical fiber. Given that refractive indices of the core and the cladding are 1.42 and 1.40 respectively. 03

c) What is total internal reflection? Explain how this phenomenon is used to guide light in an optical fiber. 05

d) Write note on applications of laser. 05

Q.3. Attempt any three.

a) With neat diagram explain the function of various essential components of a nuclear reactor. 06

b) Define effective multiplication factor and explain the concept of critical size, supercritical size and subcritical size. 05

c) i) Distinguish between nuclear fission and Nuclear fusion. 02

  ii) Explain proton-proton cycle. 03

d) Mumbai requires 3000 MWh of electric energy per day. It is to be supplied by a reactor with an efficiency 20%. If the reactor uses U^{235} as a nuclear Fuel, calculate the mass of U^{235} needed for one day's operation.

Given : One U^{235} nuclears on fission gives 200 Mev energy. 05

Q.4. Attempt any three.

a) Discuss the cymmetry elements of cubic lattice structure. 06

b) Define atomic packing fraction and obtain its values for SC, BCC and FCC 06

c) What are Miller Indices? Explain the procedure to find Miller Indices of a plane. 05

d) i) X-rays of wavelength 1.6 A⁰ is diffeacted by Bragg's spectrometer at an angle of 4⁰12' in the second order. Calculate the interplanar spacing 'd'. 02

  ii) Show the planes in cubic (100), (101) and (111) 03

Q.5. Attempt any three.

a) Discuss the concept of dual nature of light, State the de-Broglie hypothesis of matter wave and derive matter wavelength in terms of potential difference V, used to accelerate the particle. 06

b) Explain Heisenberg's Uncertainty principle. 05

c) What is comption effect? Show that comption shift ($\Delta\lambda$) depends on Scattering angle θ. 05

d) The X-ray photon is Comption Scattered by an electron through an angle of 90⁰. Find the energy (in KeV) of the scattered X-ray photon for the incident photon of energy 10 KeV. And hence find the energy of recoiled electron in KeV. 06

Q.6. Attempt any three.

a) Explain in brief two approaches used in synthesis of nanomaterials. 06

b) Describe the construction and working of Scanning tunneling microscope. 05

c) State different (any three) properties of CNTs 05

d) Write a note any two properties of nanomaterials. 05