

B.TECH. SEM -II (2007 COURSE) (ALL BRANCHES) :
WINTER - 2017

SUBJECT : ENGINEERING SCIENCES – II

Day : **Tuesday**
Date : **21/11/2017**

Time : **10.00 AM TO 01.00 PM**
Max. Marks : **80**

W-2017-2348

N. B. ;

- 1) **Q. No. 1 and Q. No. 5 are COMPULSORY.** Out of remaining attempt **ANY TWO** questions from each section.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answers to both the sections should be written in the **SEPARATE** answer books.
- 4) Draw neat and labelled diagrams **WHEREVER** necessary.
- 5) Use of non-programmable calculator is **ALLOWED**.
- 6) Assume suitable data, if necessary.

SECTION – I

Constants:

$$e = 1.6 \times 10^{-19} C$$

$$m_e = 9.1 \times 10^{-31} kg$$

$$h = 6.63 \times 10^{-34} J.s$$

$$m_p = 1.66 \times 10^{-27} kg$$

$$N_a = 6.025 \times 10^{23} atoms / gm - mole$$

- Q. 1**
- a) Explain, how Bainbridge mass spectrograph can be used for separating isotopes? **(06)**
 - b) Derive Schrodinger's time independent wave equation. **(05)**
 - c) Calculate the mobility of charge carriers in a doped silicon whose conductivity is 100 per $\Omega.m$ and hall coefficient is $3.6 \times 10^{-4} m^3 / coulomb$. **(03)**
- Q. 2**
- a) Explain principle, construction and working of cyclotron. **(05)**
 - b) Derive an expression for the displacement produced when an electric field act perpendicular to the motion of electron. **(05)**
 - c) In a thermonuclear reaction, $1 \times 10^{-3} kg$ of hydrogen is completely converted into $0.993 \times 10^{-3} kg$ helium. Calculate the energy released in this process. **(03)**
- Q. 3**
- a) Explain Davisson – Germer's experiment on electron diffraction and derive an expression for de Broglie Wavelength. **(05)**
 - b) State Heisenberg's uncertainty principle and illustrate with r-ray microscope. **(05)**
 - c) An electron is accelerated through a potential difference of 10 kV. Calculate the de-Broglie wavelength and momentum of an electron. **(03)**
- Q. 4**
- a) Give the energy band pictures of lithium, beryllium and diamond. **(05)**
 - b) What is photovoltaic effect? Give the significance of the cell parameters I_{sc} , V_{oc} and fill factor. **(05)**
 - c) Find the current density of wire carrying current 2 amperes and having a 1 mm radius. **(03)**

P. T. O.

SECTION – II

- Q. 5** a) What kind of corrosion occur if metal is exposed to: (06)
i) Acidic environment
ii) Slightly Alkaline medium
b) Write a note on Polyethylene and Polymethyl methacrylate. (04)
c) Describe important characteristics of electromagnetic radiations. (04)
- Q. 6** a) Define corrosion. Explain different factors affecting corrosion. (05)
b) What are the merits and demerits of organic and inorganic coatings? (04)
c) Distinguish between anodic and cathodic metallic coatings. Which is more preferred one? Why? (04)
- Q. 7** a) Describe preparation, properties and uses of: (05)
i) Polyurethanes
ii) Polycarbonates
b) Explain in brief classification of plastics. (04)
c) Distinguish between thermoplastic and thermosetting resins. (04)
- Q. 8** a) Define electronic spectroscopy. What is its absorption range? Give the relation between wavelength, frequency and wave number. (05)
b) What is vibrational frequency? Give a mathematical expression for it. (04)
c) Define the following terms: (04)
i) Bathochromic effect
ii) Hypsochromic shift
iii) Hyperchromic effect
iv) chromophore