B.E. / B.Tech. (Model Curriculum) Semester-I & II

BSC101 - Physics

P. Pages : 2 **GUG/S/25/13165**

Time : Three Hours * 1 4 7 7 * Max. Marks : 80

Notes : 1. Due credit will be given to neatness and adequate dimensions.
2. Assume suitable data wherever necessary.
3. Illustrate your answers wherever necessary with the help of neat sketches.
4. Use of non programable calculator is permitted.
5. All questions are compulsory.
6. Due credit will be given to neatness & adequate dimensions.
7. All questions carry equal marks.

List of constants:

1) Plank's constant, $(h) = 6.634 \times 10^{-34}$ Js.
2) Free space permittivity, = $(\varepsilon_0) = 8.85 \times 10^{-12}$ F / m.
3) Mass of electron, $= (m_e) = 9.11 \times 10^{-31}$ Kg.
4) Charge on electron, $= (e) = 1.602 \times 10^{-19}$ C.
5) Velocity of light, $= (c) = 3 \times 10^{8}$ m / s

1. a) Explain the dual nature of matter. State de- Broglie's Hypothesis for matter waves. **6**

b) By Assuming electron behave like a wave, explain Davisson and Germer's experiment. **6**

c) Compute de-Broglie's wavelength of particle of mass 1.67×10^{-27} kg and energy of 10 keV. **4**

OR

2. a) Explain the concept of matter wave? Define group and phase velocity. **6**

b) Explain Heisenberg's Uncertainty principle. Obtain an expression of uncertainty Relation using thought experiment. **6**

c) What voltage must be applied to an electron microscope to produce electrons of wavelength $0.4A^{o}$? Given $e = 1.6 \times 10^{-19}$ C. **4**

3. a) Draw the diagram of showing variation of electron energy in Germanium crystal as a function of interatomic distances. **6**

b) Define fermi level in solid. Show that the fermi level in intrinsic semiconductor lies at the centre of the forbidden band gap. **6**

c) Calculate the energy band gap of metal at room temp. If $N = 5 \times 10^{25} / m^3$ & $n = 2.5 \times 10^{19} / m^3$ **4**

OR

4. a) Explain why **6**
1) Base is thin and lightly doped
2) Collector region has larger area of cross section.

b) How solids are distinguished according to Band theory? **6**

c) Calculate the fraction of electron in conduction band of diamond at 30ºC. If Band gap is 5.6 ev. **4**

5. a) Derive Clausius – Mossotti Relation in dielectrics. **6**

b) What is dielectrics. Explain the types of polarization occurs in dielectrics. **6**

c) An elemental dielectrics material has $\in_r = 12$ and it contains 5×10^{28} atom/m^3. assuming Lorentz field. **4**

OR

6. a) Derive the equation for internal field in dielectrics. **6**

b) What are the applications of pyroelectric and ferroelectric materials. **6**

c) Define the terms **4**
1) Induced dipole. 2) Permanent dipole.

7. a) Obtained condition for maxima and minima due to interference of reflected light in the thin film of uniform thickness. **6**

b) Explain the principle of Anti Reflection coatings. **6**

c) Calculate wedge angle, if the fringes are of equal thickness are observed in thin film glass wedge of refractive index 1.52. The fringes spacing is 0.1 mm, wavelength of light is 5893Aº. **4**

OR

8. a) Prove that the velocity acquired by an electron in a uniform electrostatic field varies as the square root of potential difference through which it is accelerated. **6**

b) What are the various part of CRO? Explain it. **6**

c) With the help of neat labelled diagram, explain the concept of cross field. **4**

9. a) What is coherence? Explain the terms spatial coherence and temporal coherence. **6**

b) What is population Inversion? How it is achieved by optical pumping. **6**

c) Discuss the working of semiconductor Laser. **4**

OR

10. a) Explain the construction of optical fibre. **6**

b) What are the different losses occurring in optical fibre. Explain it. **6**

c) Determine the NA of step index fibre, when the core refractive index $\mu_1 = 1.5$ & the cladding refractive index $\mu_2 = 1.48$. Also find maximum angle for entrance of light if the fibre is placed in air. **4**

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