B.E. All Branches Second Semester (C.B.S.) / B.E. (Fire Engineering) Second Semester

Advanced Physics

P. Pages : 2 **NRT/KS/19/3288/3940**

Time : Two Hours * 0 5 7 4 * Max. Marks : 40

Notes : 1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Assume suitable data whenever necessary.
7. Illustrate your answers whenever necessary with the help of neat sketches.

List of constants:

i) Velocity of light $c = 3\times10^{8}\,m/sec$

ii) Charge of electron $e = 1.6\times10^{-19}\,C$

iii) Mass of electron $m = 9.11\times10^{-31}\,kg$

iv) $1amu = 1.67\times10^{-27}\,kg$

v) Mass of proton $= 1.67\times10^{-27}\,kg$

vi) Plank's constant $= 6.634\times10^{-34}\,J.sec$

1. a) Explain the working of He-Ne laser with the help of suitable energy level diagram. **4**

b) Differentiate between three level laser system and four level laser system. **3**

c) Find the ratio of population of two states in He-Ne laser that produce light of wavelength 6328 Aº at 27º C. **3**

OR

2. a) What is antireflection coating? Obtain an expression for minimum thickness of the coating material. **4**

b) In Newton's Ring's experiment, explain why. **3**
i) Rings get closer away from the center.
ii) Fringes are circular.
iii) Central fringe is dark in reflected light.

c) When a wedge shaped air film is viewed by a monochromatic source of light incident normally, the interference fringes 0.4mm apart are observed. If the air space is filled with water $(\mu = 1.33)$ how far apart will the fringes be observed? **3**

3. a) Show that an electron moving with uniform velocity follows a parabolic path in transverse uniform electric field. **4**

b) Show that the velocity acquired by an electron in uniform electrostatic field varies as the square root of potential difference through which it is accelerated. **3**

c) An electron having velocity 10^6m/s experiences a maximum force of 1.6×10^{-14} N when it enters a uniform magnetic field. What is the magnitude of the magnetic field? **3**

OR

4. a) Explain construction and working of velocity selector arrangement. **3**

b) How can a charged particle be made to travel a helical path in uniform magnetic field? Obtain an expression for pitch of this helix. **4**

c) An electron starts from rest and moves freely in an electric field of intensity 1500 V/m. Determine the force on the electron and acceleration attained by the electron. **3**

5. a) Explain construction and working of Bainbridge Mass Spectrograph. **4**

b) Explain briefly the electrostatic focusing. **3**

c) In a Bainbridge mass spectrograph, the electric field used is $8\times10^{14}\,V/m$ .The magnetic field common to both places is $0.20wb/m^2$ if the ion source consist of singly ionized neon isotopes of atomic masses 20 and 22, calculate linear separation of lines formed on photographic plate. **3**

OR

6. a) Explain the Bethe's law with necessary diagram and state its similarities with Snell's law. **3+1**

b) Draw Block Diagram of CRO. **3**

c) A particle cyclotron is designed with dees of radius 0.75m and with magnets that can provide a field of 1.5 T. What is the maximum energy of proton that can be obtained? **3**

7. a) Define acceptance angle. Deduce an expression of acceptance angle of optical fiber. **4**

b) Explain step index and graded index fiber. **3**

c) The numerical aperture of an optical fiber is 0.5 and the core refractive index is 1.54. find the refractive index of cladding. **3**

OR

8. a) What are nanomaterials? Write the reasons for change in properties of material at nanoscale. **3**

b) How are nanomaterials synthesized? Describe any one method. **4**

c) State the applications of nanomaterials in Engineering. **3**

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