

Roll No

BE - 201**B.E. I & II Semester**

Examination, June 2016

Engineering Physics*Time : Three Hours**Maximum Marks : 70*

- Note:* i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.
 ii) All parts of each question are to be attempted at one place.
 iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.
 iv) Except numericals, Derivation, Design and Drawing etc.

Unit - I

1. a) What do you understand by wave function?
- b) Obtain operator values of energy \hat{E} .
- c) Find out the relationship between group velocity (v_g) and wave velocity (v_p).
- d) What is the uncertainty principle? Apply this to prove the non-existence of electron in the nucleus.

OR

Derive an expression for time independent Schrodinger wave equation to particle trap in a one dimensional square potential well.

Unit - II

2. a) In Newton's ring experiment why the Plano convex lens have larger radius of curvature?
- b) Give the methods for producing plane polarized light.
- c) A source containing a mixture of hydrogen and deuterium atoms emits a red double at $\lambda = 6563 \text{ \AA}$. Whose separation is 1.8 \AA . Find the minimum number of lines required in a plane transmission grating which can resolve the double in the first order.
- d) Give the complete description of Michelson's interferometer.

[2]

OR

Show that the thin film which appears bright in reflected light, appears dark in transmitted light. Deduce the necessary expression.

Unit - III

3. a) Explain briefly the shell model of nucleus.
- b) A GM counter wire collects 10^8 electrons per discharge. When the counting rate is 500 counts/minute, what will be the average current in the circuit?
- c) Write a short note on LINAC.
- d) Discuss the construction and working of Bainbridge mass spectrograph.

OR

Explain the principle and working of an Aston's mass spectrograph. Derive the condition for its focussing.

Unit - IV

4. a) Explain Type-I and Type-II superconductors.
- b) Discuss the breakdown mechanism in P-n junction.
- c) Write down the important conclusions of Kronig-Penney model. Draw $E-k$ curve for a one dimensional lattice.
- d) Prove that in an intrinsic semiconductor the Fermi level lies in the middle of the forbidden gap.

OR

Give the relationship between \vec{E} , \vec{D} and \vec{P} vectors. What is the significance of each of these vectors?

Unit - V

5. a) What is a LASER? How does the light from laser differ from ordinary monochromatic source?
- b) Explain the difference between step index fibre and graded index fibre.
- c) Explain how helium neon laser is superior to a ruby laser?
- d) An optical fibre has a NA of 0.20 and a cladding refractive index of 1.59. Determine the acceptance angle for the fibre in water which has a refractive index of 1.33.

OR

What is a carbon-dioxide (CO_2) laser? Explain its setup along with vibrational modes of CO_2 molecule.
