G 1278 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2015

First and Second Semester

EN 010 102—ENGINEERING PHYSICS

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

{Common for all branches}

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. What are the applications of holographic techniques ?
2. Explain zero resistance. How it is realised ?
3. State the different classes of liquid crystals.
4. What are the causes of reverberation in a hall ?
5. Compare and contrast single mode and multimode optical fibre.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. (a) Explain spontaneous and stimulated emission of radiation.
   (b) Calculate the energy difference between two states, transition between them produces photons of wavelength 630 nm.
7. (a) How the semiconducting nanomaterials are characterized optically ?
   (b) Calculate the critical current and current density through a thin superconducting aluminium wire of diameter 1.4 mm. The critical magnetic field for Aluminium is 12.5×10^3 A/m.
8. What is co-ordination number ? Calculate the co-ordination number for a simple cubic, body centered cubic and face centered cubic lattice.
9. (a) What are the medical applications of ultrasonics ?
   (b) A Raman line is observed at 4767.12 Å when the material was excited by 4358 Å radiations. Calculate the vibrational frequency that causes this Raman shift.

Turn over

10. (a) What is meant by numerical aperture of an optical fibre ?

(b) A step-index fibre having a core of radius 25 mm. and V-number 26.6 at a wavelength 1300 nm. Calculate the numerical aperture.

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. Explain the operation of a Helium-Neon gas laser with the essential components. How stimulated emission takes place with the exchange of energy between Helium and Neon atoms ?

Or

12. (a) Explain the essential requirements for producing laser action. Outline how these are usually obtained ?

(6 marks)

(b) Describe recording and reconstruction of a hologram. (6 marks)

13. (a) Explain how the electrical properties of a conductor are influenced by the size confinement.

(5 marks)

(b) What are superconductors ? Discuss the highlights of BCS theory of superconductivity.

(7 marks)

Or

14. (a) Describe different types of superconductors and their applications. (6 marks)

(b) Explain the magnetic properties of nanomaterials. (6 marks)

15. (a) What do you mean by Miller indices ? Explain. (5 marks)

(b) Draw the (110) and (111) planes and [110] and [111] directions in a simple cubic crystal. What do you infer from these diagrams ?

(7 marks)

Or

16. Describe the construction and working of Bragg's X-ray spectrometer. How is it used to verify Bragg's law of X-ray diffraction ?

17. (a) Explain the magnetostriction methods of generation of ultrasonic waves. (6 marks)

(b) Discuss Sabne's formula for the time of reverberation and its applications. (6 marks)

Or

18. What is the principle of ultrasonic detection ? Describe an ultrasonic flaw detector and explain the pulse-echo method to determine the position and size of a crack in a specimen.

19. Define and explain the following in optical fibers :—

(i) Critical angle of propagation.

(ii) Half angle of acceptance.

(iii) Numerical aperture.

(iv) Bandwidth-distance product.

(4 × 3 = 12 marks)

Or

20. With neat diagrams, explain the working of any *five* types of optical fibre sensors and their applications.

[5 × 12 = 60 marks]