Reg. No. : ....

Name : ....

Combined First and Second Semester B.Tech. Degree Examination, December 2015
(2013 Scheme)
13.102 : ENGINEERING PHYSICS (ABCEFHMNPRSTU)

Time : 3 Hours   Max. Marks : 100

John Cox Memorial CSI Institute of Technology
Kannammcola, Thiruvananthapuram
695011

PART – A

Answer **all** questions. **Each** question carries 2 marks.

1. A simple harmonic motion is represented by $x(t) = 5 \sin [2 \pi t + 0.5]$ in S.I. units. Find amplitude, angular frequency, time period and maximum velocity of the particle.

2. What is wave motion ? Explain the two types of wave motion.

3. Explain the concept of displacement current.

4. Define co-ordination number and packing fraction.

5. Explain Rest mass and Relativistic mass. Give the relation between them.

6. Describe Meissner effect.

7. Distinguish between Fresnel's and Fraunhoffer's classes of diffraction.

8. Explain phase space.

9. Distinguish between quarter wave plate and half wave plate.

10. What is a wave function ? Explain its physical significance.

PART – B

Answer **one full** question from **each** Module. **Each** question carries **20** marks.

MODULE – I

11. a) Set up the differential equation of a forced harmonic oscillator and discuss the condition for resonance. **10**

    b) Discuss the theory of transverse vibrations of a stretched string and obtain the expression for the velocity of transverse waves. **10**

12. a) Show that Maxwell's equations predict the existence of electromagnetic waves. **10**

    b) Derive one dimensional wave equation. **6**

    c) State and explain Poyntings theorem. **4**

MODULE – II

13. a) State the postulates of special theory of relativity using Lorentz transformation equation obtain the expression for time dilation. **10**

    b) Describe high temperature superconductors. **6**

    c) Lattice constant of a cubic lattice is 1°A. Calculate the spacing between (i) (011) and (ii) (111) planes. **4**

14. a) Derive mass energy relation. **8**

    b) What are Miller indices ? Explain the procedure used to find out Miller indices of a crystal plane. **6**

    c) Describe BCS theory. **6**

MODULE – III

15. a) Explain the formation of colours in thin films when viewed in sunlight. **6**

    b) Describe the working and uses of Nicol prism. **6**

    c) Describe the principle, construction and working of a Piezoelectric oscillator. **8**

16. a) Obtain an expression for the radius of the nth dark ring in the case of Newton's ring pattern. **6**

    b) Describe the production and detection of plane and circularly polarised light. **8**

    c) A monochromatic light from He-Ne laser of wavelength 632.8 nm is incident normally on a diffraction grating containing 6000 lines per cm. Find (i) angles at which first and second order maxima are observed (ii) the highest order of the spectrum. **6**

MODULE – IV

17. a) Derive the time independent Schrodinger wave equation. 8

    b) Explain the principle and working of He-Ne laser. 8

    c) State and explain Maxwell Boltzman distribution law. 4

18. a) What is fermi gas ? Obtain an expression for the fermi energy of electron gas. 8

    b) Explain the process of construction and reconstruction of a Hologram. 8

    c) Calculate the uncertainty in the measurement of momentum of an electron if the uncertainty in locating it is 1°A. 4