



Reg. No. : .....

Name : .....

**Combined First and Second Semester B.Tech. Degree  
Examination, March 2018  
(2013 Scheme)  
13.102 : ENGINEERING PHYSICS (ABCEFHMNPRSTU)**

Time : 3 Hours

Max. Marks : 100

**PART – A**

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

1. What is resonance ? Give two examples.
2. State and explain poynting's theorem.
3. Define space lattice and unit cell.
4. State the postulates of special theory of relativity.
5. What are non-reflecting films ?
6. What is Rayleigh's criterion for geometric resolution ?
7. Calculate the thickness of a half wave plate of quartz for light of wavelength 589.3 nm for quartz  $\mu_o = 1.5442$  and  $\mu_e = 1.5533$ .
8. Explain uncertainty principle.
9. Explain microstate and macrostate.
10. Outline briefly the characteristics of LASER.

**PART – B**

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

**Module – I**

11. a) Frame and solve the differential equation for SHM. 7
- b) Derive one dimensional wave equation. 9
- c) A wave is represented by  $\psi = 3.0 \times 10^{-3} \cos (8.4 \times 10^{13} t + 2.8 \times 10^5 z) \text{ Vm}^{-1}$   
Compute the  
i) amplitude                      ii) frequency  
iii) wave length and    iv) wave velocity  
(z in meter and t in second). 4

P.T.O.



12. a) Derive free space electromagnetic wave equation and show that velocity of an EM wave in free space is  $1/\sqrt{\mu_0\epsilon_0}$ . 10
- b) Show that electromagnetic waves are transverse in nature and have components of  $\vec{E}$  and  $\vec{H}$  in direction perpendicular to the direction of propagation. 10

### Module – II

13. a) Distinguish between Type I and Type II superconductors. 10
- b) What are Miller indices? Obtain a relations between interplanar spacing and Miller indices. 7
- c) Sketch the (110), (100) and (111) planes of a cubic crystal. 3
14. a) Derive the relation  $E = mc^2$ . 8
- b) Illustrate Meissner effect in superconductivity. 6
- c) Explain the phenomenon of time dilation. 6

### Module – III

15. a) Explain the formation of bands in air-wedge. Describe the experimental method of determining the thickness of insulation of an insulated wire. 10
- b) Derive cosine law in reflected system. 6
- c) Newton's rings are observed in reflected light of wavelength  $5.9 \times 10^{-5}$  cm. The diameter of 10<sup>th</sup> dark ring is 0.5 cm. Find the radius of curvature of the lens and thickness of air film. 4
16. a) Describe the construction and working of a Nicol prism. 10
- b) Explain piezoelectric generator. 6
- c) Explain the important applications of ultrasonics in industrial and medical field. 4

### Module – IV

17. a) Write down Schrodinger equation for particle in a box. Solve it and obtain energy eigen function and energy eigen values. 10
- b) Explain the principle and working of Ruby Laser. 10
18. a) Deduce Planck's law from BE statistics. 10
- b) Describe how holograms can be recorded and reconstructed. 5
- c) Find the Fermi energy in chromium assuming that each chromium atom contribute one free electron to Fermi gas. The density of chromium is  $7.2 \times 10^3$  kg/m<sup>3</sup> and atomic mass is 52 amu. 5