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A – 6611

Reg. No. : .....

Name : .....

Combined First and Second Semester B.Tech. Degree Examination, December 2016

(2013 Scheme)

13.102 : ENGINEERING PHYSICS (ABCEFHMNPRSTU)

Time : 3 Hours Max. Marks : 100

PART – A

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

1. Define S.H.M. Explain the term "phase" of a body executing S.H.M.
2. What are E. M. Waves ? How they propagate ?
3. Explain unit cell and lattice parameters of a crystal structure.
4. Explain the postulates of special theory of relativity.
5. What is interference ? Can interference be observed with independent sources of light ?
6. Distinguish between Quarter wave plate and Half wave plate.
7. Explain some of the potential applications of ultrasonic waves.
8. Explain the physical significance of the wave function 'ψ'.
9. What is fermi level ? Give its physical significance.
10. Explain the applications of holography.

P.T.O.

PART – B

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

Module – I

11. a) Differentiate between free, forced and damped vibrations. What is resonance ? Give some practical examples of resonance. **6**

    b) State and explain the laws of fundamental transverse vibrations of stretched strings. Calculate the frequency of the fundamental note of a string 1 metre long and weighing 2 gms when stretched by a weight of 400 kg. **10**

    c) Find the acceleration of a body executing S.H.M. at 20 cm from its mean position. The time period of oscillation of the body is 10 sec and amplitude is 1 metre. How long will it take to travel 70 cm from one of its extremities ? **4**

12. a) Deduce and discuss the physical significance of Maxwell's equations. **10**

    b) How will you signify the divergence and curl of a vector field ? **6**

    c) Discuss the Poynting theorem for the flow of energy in an electromagnetic field. **4**

Module – II

13. a) What do you understand by space lattice ? Enumerate the seven crystal systems with their salient features. **8**

    b) Write down Lorentz transformation equation for co-ordinates and explain length contraction. **6**

    c) Explain the properties of super-conducting materials. **6**

14. a) Find expressions for atomic radii in terms of lattice constant for :

        i) The sample cubic

        ii) b.c.c and

        iii) f.c.c. crystal structures. **4**

    b) Derive Einstein's mass-energy relation. **10**

    c) Write short notes on :

        1) Super conductivity

        2) Meissner effect and

        3) Isotopic effect. **6**

Module – III

15. a) Discuss the theory of plane transmission grating and derive the grating equation. **7**

    b) With necessary theory, explain the production and analysis of circularly and elliptically polarised light. **9**

    c) In Newton's rings experiment, the diameter of 4^{th} and 12^{th} dark rings are 0.4 cm and 0.7 cm respectively. Find the diameter of 20^{th} dark ring. **4**

16. a) Explain how Newton's Rings are formed. Derive the expressions for the radii of bright and dark rings in reflected system. **10**

    b) Explain the magneto striction method for the production of ultrasonic waves. **6**

    c) Plane polarised light is incident normally on a piece of quartz cut with its face parallel to optic axis. Find the least thickness of the plate for which the ordinary and extra-ordinary waves combine to form plane polarised light.

    Given $\mu_0 = 1.5442$, $\mu_e = 1.5533$ and $\lambda = 500$ nm. **4**

Module – IV

17. a) Obtain Schroedinger time dependent equation starting from a plane wave equation. **8**

    b) Mention the assumptions of M – B, B – E and F – D statistics. **6**

    c) Explain the working of a diode laser with a neat diagram. Mention its salient features. **6**

18. a) i) Explain uncertainty principle.

    ii) The time gap between excitation and radiation of an atom is $\Delta t = 10^{-8}$ sec. Find the uncertainty in the frequency of the radiation. **6**

    b) Find the Fermi energy in copper assuming that each copper atom contributes one free electron to the electron gas. Density of copper is 8.94×10^3 kg m^{-3} and atomic weight is 63.5 amu. **4**

    c) Write a short note on the following :

    1) Stimulated emission
    2) Population inversion
    3) Pumping mechanism
    4) Optical cavity
    5) Characteristics of lasers. **10**