

Code : 221101

## B.Tech 1st Semester Exam., 2015

## PHYSICS

Time : 3 hours

Full Marks : 70

Instructions : akubihar.com

- (i) The marks are indicated in the right-hand margin.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question No. 1 is compulsory.

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1. Answer any seven questions :  $2 \times 7 = 14$ 

- (a) Find the capacitance of a capacitor which stores 0.24 coulomb at 10 volts.
- (b) What do you mean by degrees of freedom of a system?
- (c) Mention any two properties of nano-particles.
- (d) What is the velocity of electromagnetic wave in free space and in lossless dielectric?

- (e) What is the net capacitance if three 10  $\mu\text{F}$  capacitors are connected in parallel?
  - (f) Define Poynting vectors.
  - (g) Voltage applied across a ceramic dielectric produces an electrolytic field 100 times greater than air. What will be the value of dielectric constant?  $E =$
  - (h) What is meant by laser welding?
  - (i) What is the practical significance of dielectric strength?
  - (j) What do you mean by solenoidal and irrotational vectors?
2. (a) Describe any two methods of production of nanomaterials. 8
- (b) State Wien's radiation formula and give its limitations. 6
3. Explain in detail how optical fibres are classified according to the material, refractive index and modes of propagation. 14
4. (a) Explain the working principle and construction of a ruby laser. 10

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- (b) Calculate the de Broglie wavelength associated with an electron of energy 1.5 eV. 4
5. (a) Explain the construction and working of CO<sub>2</sub> laser with its advantages. 12
- (b) Give physical interpretation of wave function. 2
6. (a) Show that plane polarised and circularly polarised light are the special cases of elliptically polarised light. 8
- (b) Explain normalized and orthogonal wave functions. 6
7. Write short notes on the following : 5+5+4=14
- (a) Brewster's law
- (b) Gauss's law in dielectric
- (c) Photoelectric effect
8. (a) Explain in brief Compton effect on the basis of quantum hypothesis. What is its physical significance? 8

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- (b) In Compton experiment, the wavelength of X-ray radiation scattered at an angle of 45° is 0.022 Å. Calculate the wavelength of the incident X-rays. 6
9. (a) Derive the Poynting theorem and give its significance. 10
- (b) Describe briefly about reflection coefficient and transmission coefficient. 4

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