

Code : 221101

B.Tech 1st Semester Exam., 2015

PHYSICS

Time : 3 hours

Full Marks : 70

Instructions :

- (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.

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 nanoparticles.  
(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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