

17210

21718

2 Hours / 50 Marks

Seat No.

--	--	--	--	--	--	--	--	--

- Instructions :**
- (1) All Questions are *compulsory*.
  - (2) Answer each next main Questions on a new page.
  - (3) Figures to the right indicate full marks.
  - (4) Assume suitable data, if necessary.
  - (5) Use of Non-programmable Electronic Pocket Calculator is permissible.
  - (6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

**Marks**

1. Attempt any NINE of the following :

**18**

- (a) State Ohm's law with mathematical equation.
- (b) Explain the principle of potentiometer.
- (c) Draw a neat diagram of Wheatstone's network.
- (d) When a charge of  $0.05 \mu\text{C}$  is given to a conductor, its potential is raised to 100 V. Find its capacitance.
- (e) Define conduction band & forbidden energy gap.
- (f) State the values or range of values of energy band gap for conductor, semiconductor & insulator.
- (g) State Planck's quantum hypothesis.
- (h) An X-ray tube is operated at 50 kV. What will be the wavelength of X-rays emitted in it ?
- (i) State two points of differentiation between spontaneous & stimulated emission.
- (j) Define optical pumping & population inversion.
- (k) Define nanometer & nanoparticle.
- (l) State any two properties of nanoparticle.

[1 of 2]

**P.T.O.**

**2. Attempt any FOUR of the following :****16**

- (a) The specific resistance of the material of wire is  $3 \times 10^{-7} \Omega\text{m}$ . If the resistance of the wire is  $4 \Omega$  & radius of the wire is 0.6 mm, calculate the length of the wire.
- (b) State & explain balancing condition of Wheatstone's network.
- (c) Obtain an expression for equivalent capacitance of capacitors connected in parallel combination.
- (d) Area of parallel – plate condenser is  $1.6 \text{ m}^2$  & distance between the two plates is 1.2 mm. Dielectric constant of the material between the two plates is 3. Find capacitance of the condenser. (Given :  $\epsilon_0 = 8.85 \times 10^{-12}$ )
- (e) Distinguish between P-type & N-type semiconductor.
- (f) Plot & explain I-V characteristics of p-n junction diode.

**3. Attempt any FOUR of the following :****16**

- (a) Draw energy band diagram for conductor, semiconductor & insulator.
  - (b) The threshold frequency of a metal is  $1.2 \times 10^{15} \text{ Hz}$ . If a light of frequency  $1.5 \times 10^{15} \text{ Hz}$  is made incident on the metal plate, calculate the maximum K.E of the ejected photoelectron. ( $h = 6.62 \times 10^{-34} \text{ Js}$ )
  - (c) State any four properties of X-rays.
  - (d) Explain with help of neat & labelled diagram the working of He-Ne laser.
  - (e) (i) State Einstein photo-electric equation of photo-electric emission with meaning of symbol.  
(ii) State any two Engg. application of X-rays.
  - (f) State four applications of nanomaterial in Engineering field.
-