



17210

21314

2 Hours/50 Marks

Seat No.

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- Instructions:** (1) **All** questions are **compulsory**.  
(2) Answer **each** Section on same answer sheet.  
(3) Answer **each** next main question on a **new** page.  
(4) Illustrate your answers with **neat** sketches **wherever** necessary.  
(5) Figures to the **right** indicate **full** marks.  
(6) Assume suitable data, **if necessary**.  
(7) Use of Non-programmable Electronic Pocket Calculator is **permissible**.

MARKS

1. Solve **any nine** of the following.

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- State the unit of electric current and define it.
- State the principle of potentiometer.
- Define one farad capacity of the condenser.
- Separate out following materials as P-type impurity and N-type impurity Boron, Aluminium, Antimony, Indium, Arsenic and Gallium.
- Calculate the frequency of an accelerated electron if its energy is  $5.296 \times 10^{-15}$  Joule and Plank's constant  $h = 6.62 \times 10^{-34}$  J.S.
- Define :
  - Photoelectric work function
  - Threshold frequency.
- Give full form of LASER.
- What is photoelectric effect ?
  - What is optical pumping ?
- An electric heater draws a current of 5A when connected across 220 volt supply. What current will it draw when connected across 440 volt supply ?
- Draw the diagram of construction He-Ne gas laser.
- State any two engineering applications of nanotechnology.

P.T.O.

2. Solve **any four**.

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- a) Obtain the balancing condition for Wheatstone's Network.
- b) Coils of resistances  $40\ \Omega$ ,  $60\ \Omega$  and  $30\ \Omega$  are connected in the arms of AB, BC and CD of Wheatstone's network respectively. Calculate the (i) resistance of the coil that should be connected in arm AD of Wheatstone's network to balance the network.
- c) Obtain the expression for effective capacitance when three capacitors are connected in parallel.
- d) Area of a parallel plate condenser is  $3.21\ \text{m}^2$  and the distance between the plates is  $0.1\ \text{mm}$ . Find the dielectric constant if capacity of it is  $1.99\ \mu\text{F}$ , given  $\epsilon_0 = 8.9 \times 10^{-12}$ .
- e) Describe P-type of semiconductor with diagram in detail.
- f) Explain p-n junction diode in forward biased mode with diagram.

3. Solve **any four** of the following.

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- a) Distinguish between conductor, insulator and semi conductor substances.
  - b) Define :
    - i) Specific resistance
    - ii) Potential gradient
    - iii) Stopping potential
    - iv) Photon.
  - c) What are X-rays ? Mention its engineering applications.
  - d) Name the different methods of synthesis of nanoparticles. Explain physical method of synthesis of nano-particles in detail.
  - e) Distinguish between spontaneous and stimulated emission.
  - f) The photoelectric work function of a metal is  $5\ \text{eV}$ . Calculate the threshold frequency and threshold wavelength if  $h = 6.6 \times 10^{-34}\ \text{Js}$ ,  $C = 3 \times 10^8\ \text{m/se}$ .
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