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मक्षिका - 006

Engineering Physics - I (101101)

P. Pages : 3

Time : Three Hours

Max. Marks : 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Attempt **any two** sub question from each unit.
5. Assume suitable data wherever necessary and state the assumptions made.
6. Diagrams / sketches should be given whenever necessary.
7. Use of non-programmable calculator is permitted.
8. Figures to the right indicate full marks.

UNIT - I

1. a) What is wind energy ? Explain the construction and working of wind mill. 8
b) i) Give merit and demerits of Solar cell. 4
ii) If a group of 5 solar cells are connected in series and such a two groups are connected in parallel. Calculate total output voltage and current produced.
(Given : Each cell provides 0.5 volts and 50 mA current when illuminated) 4
c) i) Define the following term : 4
 - 1) Chain reaction
 - 2) Biogas
 - 3) Non-conventional energy source
 - 4) Nuclear fissionii) Calculate the power output of nuclear reactor which consumes 10 kg of U^{235} per day. Given that the average energy released per U^{235} fission is 200 MeV. 4

UNIT - II

2. a) Explain the construction and working of He - Ne laser with energy level diagram. 8
- b) i) Write a note on Holography. 4
- ii) An optical fibre has N. A. of 0.20 and a cladding refractive index of 1.59. Determine acceptance angle for a fibre in water which has refractive index of 1.33. 4
- c) i) State properties and applications of laser. 4
- ii) Calculate numerical aperture and acceptance angle for an optical fibre of refractive indices of core and cladding 1.45 and 1.40 respectively. 4

UNIT - III

3. a) What is atomic radius ? Obtain an expression for atomic radius of SC and BCC with suitable diagram. 8
- b) i) Give the properties and applications of x - rays. 4
- ii) The lattice constant for BCC iron at 20° is 2.87 \AA . The density of iron is 7870 kg/m^3 . Determine its atomic mass. 4
- c) i) Define the following term. 4
- 1) Bragg's law 2) Packing factor
- 3) Unit cell 4) X - ray
- ii) X-ray tube works on 40,000 Volt and at current of 3.2 mA. Calculate the minimum wavelength and the number of electrons that strike the target per second. Given : $e = 1.6 \times 10^{-19} \text{ C}$, $h = 6.62 \times 10^{-34} \text{ J-s}$. 4

UNIT - IV

4. a) Define intrinsic and extrinsic semiconductor ? Distinguish between P-type and N-type semiconductor. 8
- b) i) Define the following term. 4
- 1) Forward bias 2) Conduction band
- 3) Fermi level 4) Insulator.

- ii) Find the resistivity of intrinsic germanium at 300°K. Given that intrinsic charge carrier density is 2.5×10^{19} per m^3 , Mobility of electron = $0.39 m^2 / Vs$, Mobility of hole = $0.19 m^2 / Vs$, charge of electron = $1.6 \times 10^{-19} C$. 4
- c) i) Explain Hall effect in brief. 4
- ii) The fermi level for potassium is 2.1 eV. Calculate the velocity of electron at fermi level. 4

UNIT - V

5. a) What is interference ? Explain with neat labelled diagram the construction and working of Michelson's interferometer. 8
- b) i) Obtain an expression for resolving power of grating. 4
- ii) Calculate minimum number of lines in a grating which will just resolve in first order, the lines whose wavelengths are 5890 \AA and 5896 \AA . 4
- c) i) Give engineering applications of polarization. 4
- ii) Refractive index of plastic is 1.35. Calculate the angle of refraction for the ray of light incident at the polarizing angle. 4
