

Physics (Hons.) Paper-VII

Group-A is compulsory. Answer two questions each from Group-B and Group-C

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Group-A

1. Choose the correct answer of the following :
 - (a) The resistivity of a semiconductor increases with :
 - (i) Increase of temperature
 - (ii) Decrease of temperature
 - (iii) Without any change of temperature
 - (iv) None of these
 - (b) Addition of pentavalent impurity to a semiconductor creates many :
 - (i) Free electrons
 - (ii) Holes
 - (iii) Valence electrons
 - (iv) Bound electrons
 - (c) Work function of metals is usually measured in :
 - (i) Joules
 - (ii) Electron-volt
 - (iii) Watt-hour
 - (iv) Watt
 - (d) The energy gap between valence band and conduction band of an insulator is :
 - (i) Very large
 - (ii) Zero
 - (iii) Very small
 - (iv) None of these
 - (e) With forward bias to p-n junction, the width of depletion layer :
 - (i) Decreases
 - (ii) Increases
 - (iii) Remains the same
 - (iv) None of these
 - (f) A Zener diode is used as :
 - (i) An amplifier
 - (ii) A voltage regulator
 - (iii) A rectifier
 - (iv) A multivibrator
 - (g) Maximum power is transferred load resistance is :
 - (i) Half the internal resistance
 - (ii) Equal to internal resistance
 - (iii) Twice the internal resistance
 - (iv) None of these
 - (h) A JEFT is a device which is :
 - (i) Current controlled
 - (ii) Voltage controlled
 - (iii) Voltage and controlled both
 - (iv) None of these
 - (i) The universal logic gate is :
 - (i) OR gate
 - (ii) NAND gate
 - (iii) AND gate
 - (iv) None of these
 - (j) If the frequency of the input signal is f , the ripple frequency in a full wave rectifier is :
 - (i) f
 - (ii) $2f$
 - (iii) $f/2$
 - (iv) $4f$

Group-B

2. Distinguish among metal, semiconductor and insulator from Band theory of solids.
3. Explain Hall effect. Obtain the expression for Hall voltage and Hall coefficient. How is Hall coefficient determined experimentally.
4. State Bragg's law. How is related to diffraction of X-rays by crystals ? Obtain the law in terms of reciprocal lattice.
5. Write short notes on any two of the following : (a) Packing fraction (b) Brillouin zone (c) Binding in solids (d) Anti-ferromagnetism and ferrimagnetism

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6. Compare between BJT and FET. Describe the construction and working of JEFT and discuss its characteristic curves.
7. Explain the condition under which an amplifier becomes an oscillator. Draw the circuit diagram of Hartley oscillator and obtain an expression for the frequency of oscillation.
8. What are universal logic gates ? How can we realize OR and AND gate using universal logic gate.
9. Write short notes on any two of the following : (a) Thevenin theorem (b) h-parameter (c) Constant k-filter (d) Amplitude modulation