

# RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

FIRST YEAR

B.A./B.SC. SECOND SEMESTER (January – June) 2014

Mid-Semester Examination, March 2014

Date : 25/03/2014

**ELECTRONICS (General)**

Time : 11 am – 12 noon

Paper : II

Full Marks : 25

Answer **Question No. 1** and **any two** from the rest :

1. Choose the correct answer : [5×1]
- a) The number of electrons in the valence band of intrinsic semiconductor is :  
i) 1                                  ii) 3                                  iii) 4                                  iv) 5
  - b) What causes the depletion region?  
i) doping                                  ii) diffusion                                  iii) ions                                  iv) barrier potential
  - c) n-type semiconductor is obtained by doping silicon with—  
i) a trivalent impurity                                  ii) a tetravalent impurity  
iii) a pentavalent impurity                                  iv) gold
  - d) With rise of temperature the resistivity of an intrinsic semiconductor—  
i) changes like metals    ii) does not change                                  iii) increases                                  iv) decreases
  - e) Compared to 2-diode full-wave rectifier, the bridge rectifier has the main advantage of  
i) higher current carrying capacity                                  ii) lower PIV  
iii) lower ripple factor                                  iv) higher efficiency

**Or,**

Write a short note on the I-V characteristics of a p-n junction diode. [5]

2. a) Explain with necessary energy-level diagrams the formation of extrinsic semiconductors by adding appropriate impurities to the intrinsic semiconductor. If an extrinsic semiconductor is heated up, what will be the change in its property and why? [4+2]  
b) Using relevant expression for the energy level, find the energy level for which the probability of occupancy is half. At which temperature all the states upto this level are fully occupied? [2+2]
3. a) How does an external bias applied to a p-n junction change the current mechanism and the depletion layer width. Why is the depletion layer capacitance (space-charge type) effective only for the reversed bias mode? [4+2]  
b) What is the value of the external bias voltage for which the forward current in a p-n junction diode will be 100 times the reverse saturation current at room temperature (300°K)? [ $K_E = 8.617 \times 10^{-5} \text{ eV}$ ] [4]
4. a) Explain with the appropriate circuit diagram the operation of a full-wave bridge rectifier using p-n junction diodes. How does this compare with two-diode full-wave rectifier in respect of Regulation and conversion Efficiency? [4+2]  
b) With an input voltage  $v(t) = V_P \sin \omega t$ , derive the expression for the ripple factor expression and value for a bridge rectifier? What measure can be taken to improve the ripple factor? [3+1]

