B.Sc.(Honours)Examination, 2018

Semester–III

Physics (Honours)

Course: BPC-32

(Electronics-I)

Time: Three Hours **Full Marks: 40**

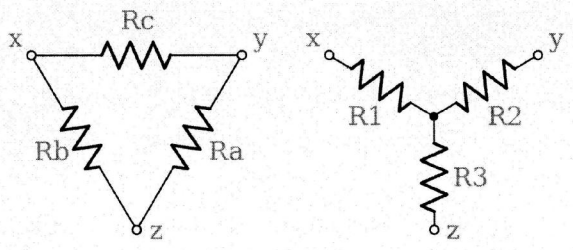
Questions are of value as indicated in the margin.

Answer***anyfour*** questions

1. (a) Define *passive*, *unilateral* and *bilateral* elements of elecrical networks. Give at leat two examples for each.

   (b) For the two equivalent circuits shown below, determine R_1 in terms of R_a, R_b, R_c.

   (c) Describe a practical voltage generator with a load using a schematic diagram. Convert the practical voltage generator into a current generator and draw the diagram. Establish the relation between the voltage and current of the two sources. 3+2+5



2. (a) State the relation between carrier concentraions in intrinsic and extrinsic semiconductors. Derive an expression for concentration of electrons in a p-type semiconductor in terms of intrinsic carrier concentration, and donor and acceptor densities.

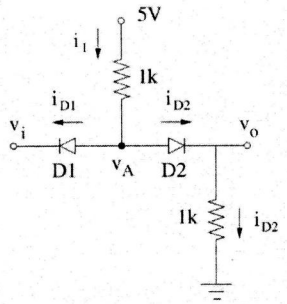
   (b) Express Fermi level (E_F) of an n-type semiconductor in terms of the lower edge of the conduction band (E_C), doping density (N_d) and temperature. In an n-type semiconductor $E_F = 0.3\ eV$ at $T = 300\ K$. Calculate E_F at $T = 320\ K$.

   (c) Define mobility (μ_n) and diffusion constant of (D_n) of electrons. Derive the Einstien relationship between μ_n and D_n. 3+4+3

3. (a) Derive an expression for the potential barrier of a pn junction.

   (b) Draw a schematic diagram of an unbiased pn junction. Plot the energy bands, Fermi level and space charge density as a function of distance from the junction.

   (c) For the circuit below with two diodes, find Find V_0 for $V_i = 5$V. 4+4+2



P.T.O.

4. (a) Explain the operation of a full wave bridge rectifier with a diagram.
   (b) Define efficiency (η) and ripple factor (γ) of a rectifier. Calculate η and γ for a full wave rectifier ithout filters.
   (c) Explain with diagram why we need filters for a rectifier? 3+4+3

5. (a) Draw the energy band diagram for a pnp transistor operating in the active region.
   (b) Show, with a diagram, the diffrent currents flowing in a transistor.
   (c) Define β and α of a tranistor. Establish relations among I_B, I_C and I_E.
   (d) Show, with a diagram, how a Dralington pair acts as a high β transistor. 2+2+3+3

6. (a) Briefly describe, with a circuit diagram, a simple AM modulator for generating AM waves.
   (b) Briefly describe how radio waves are transmitted at different distances on earth.
   (c) Make a qualitative comparision of AM and FM transmissions. 5+3+2

7. Write short notes on any two. 5+5
   (a) Tunnel diode
   (b) Photovoltaic cell
   (c) Triac
   (d) Diode envelop detector for AM detection
