RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (General) Degree
Second Year – Semester I Examination – October/November 2014

PHY 2103- ELECTRONICS

Answer any **two** questions Time: One hour
Use of a non-programmable calculator is permitted.

1. a) Explain the formation of a potential barrier in a p-n junction and show the polarity of the barrier potential. [30 marks]

   b) How does a transistor biased for its normal operation? [10 marks]

   c) What is quiescent point (Q-point) of a transistor? How do you determine it?[20 marks]

   d) For the CE circuit shown in the figure 01, draw the dc load line and mark the dc working point on it. Assume β= 100 and neglect V_{BE} [40 marks]

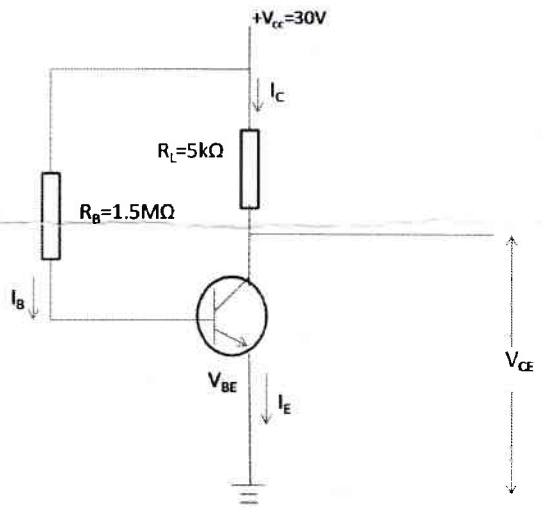

Figure 01

2. a) Describe the operation of a transistor amplifier in CE configuration. [20 marks]

b) What are the significances of transistor equivalent circuit/model? [10 marks]

c) List out the various steps to get the ac and dc equivalent circuits of transistor used in small signal ac analysis. [10 marks]

d) i. Draw the dc and ac equivalent circuits for the following CE Amplifier circuit (Figure:02). [20 marks]

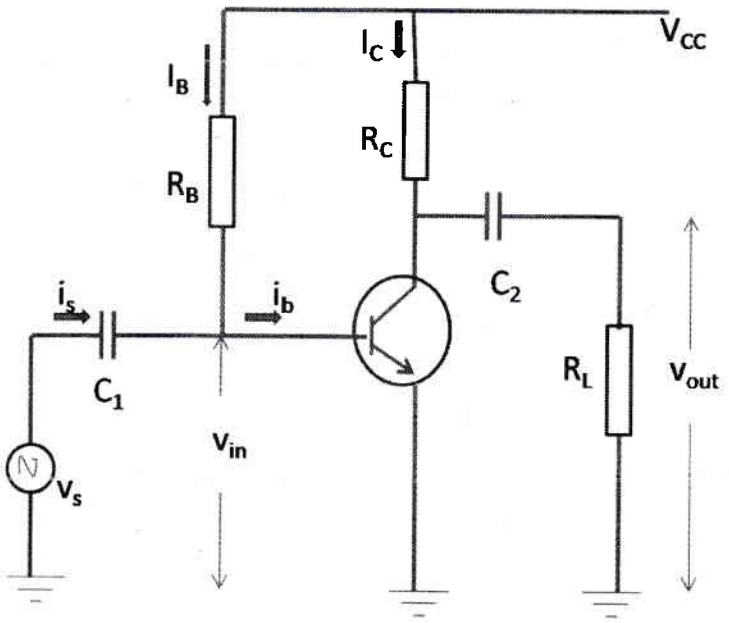

Figure:02

ii. In the CE circuit above, if
$V_{cc} = 20\ V, R_C = 10\ K\Omega, R_B = 1\ M\Omega,\ \ R_L = 1\ M\Omega,\ v_s = 2\ mV\ and\ \beta = 50$, find

i. i_b and i_c ii. r_{in} iii. r_L iv. A_v v. A_p [40 marks]

[V_T= 25 mV (at room temperature) and neglect V_{BE}]

3. Operational amplifier (op-amp) is an integrated circuit (IC's) with several amplifier stages that has a high voltage gain.

   a) What are the advantages of ICs over conventional circuits? [15 marks]

   b) Give the ideal characteristics of an operational amplifier. [20 marks]

   c) Negative feedback is the general method applied in amplifier circuits to control high voltage gains. Why? [10 marks]

   d) Draw the circuit diagram of an inverting op-amp with negative feedback and derive an expression for the voltage gain. [30 marks]

   e) For the inverting amplifier, R_1= 1kΩ and R_f= 1MΩ. Assuming an ideal amplifier, determine the following circuit values. [25 marks]

      a) Current gain
      b) Input resistance
      c) Output resistance