RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (General) Degree in Applied Sciences
Second - Year Semester I Examination – September /October 2019

PHY 2103 – ELECTRONICS I

Time: One (01) hour

- **Answer only <u>two</u> questions**
- A non-programmable calculator is permitted.
- All undefined symbols appear below have their usual meanings.

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1. a) Briefly explain the

    i.   built in potential of a p-n junction diode.   **(10 marks)**

    ii. forward biased and reverse biased characteristics of a p-n junction diode.

                                                                         (05 marks)

    b) What happens to the depletion region under different biased situations?

                                                                         (10 marks)

    c) How does the dynamic resistance of a p-n junction diode vary with the current?

                                                                         (05 marks)

    d) What distinguishes conductors, semiconductors and insulators in terms of the forbidden energy gap?   **(10 marks)**

    e) What effect do added impurities have on semiconductor conductivity?

                                                                         (10 marks)

2. a) Explain the action of the full-wave and half-wave rectifier circuits.   **(10 marks)**

    b) Draw the input and output waveforms of the bridge rectifier circuit that has a capacitor filter with a load.

                                                                         (10 marks)

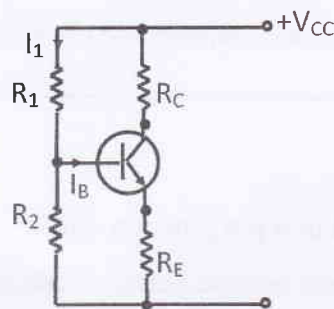   c) Derive an expressions for the ripple voltage and the ripple factor of the circuit.

                                                                         (10 marks)

d)   Given that the supply voltage is 230 V (r.m.s.), the frequency is 50 Hz, capacitance of the capacitor is 1000 μF and the load resistance is 1 kΩ, calculate the ripple voltage and the ripple factor.

(20 marks)

3.   a) Describe the operation of an n-p-n transistor.   **(15 marks)**

   b) The operating point of the circuit shown below is chosen such that $I_C = 2$ mA and $V_{CE} = 3$ V. Calculate the values of R_1, R_2 and R_E if $R_C = 2.2$ kΩ, $V_{CC} = 9$ V and $\beta = 50$. Assume that the barrier $V_{BE} = 0.6$ V and $I_1 = 10 I_B$

(35 marks)

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