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**ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)**  
**ORGANISATION OF ISLAMIC COOPERATION (OIC)**

**Department of Computer Science and Engineering (CSE)**

**MID SEMESTER EXAMINATION**

**WINTER SEMESTER, 2019-2020**

**DURATION: 1 Hour 30 Minutes**

**FULL MARKS: 75**

**Phy 4143: Physics II**

**Programmable calculators are not allowed. Do not write anything on the question paper.**

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

1. a) Discuss the characteristics of a junction diode. Distinguish an ideal diode and a practical (commercial) diode. Define diode cut-in voltage, the reverse saturation current, and the breakdown voltage? 7
- b) Discuss the characteristics of a practical diode. How would you draw the load-line of a diode? Draw I-V characteristics of an ideal diode and a practical diode and discuss these two curves in terms of diode response to an AC and a DC signal. Assume any values of I and V to draw the load line. 10
- c) Draw a diode characteristics curve to show that the device ideally acts as a low resistance path to current in the reverse direction much like a switch that passes current in only one direction. 8
2. a) State and explain Kirchoff's voltage (KVL) and current laws (KCL). What is an equivalent circuit? Draw three voltage sources  $V_1$ ,  $V_2$  and  $V_3$  in series and hence transform it to the equivalent circuit. 7
- b) Three resistor of values : 10 Ohms, 20 Ohms and 30 Ohms, respectively are connected in series across a 12 Volt battery supply. Calculate : 10
  - i. the total resistance
  - ii. the circuit current
  - iii. the current through each resistor
  - iv. the voltage drop across each resistor
  - v. hence verify that Kirchoff's voltage law holds true
- c) Answer the followings: 8
  - i. Draw a network of resistors  $R_1$ ,  $R_2$  and  $R_3$  in "Y form" and in "T form"
  - ii. Draw a network of resistors  $R_1$ ,  $R_2$  and  $R_3$  in " $\Delta$  form" and in "II form"
3. a) State and explain Thevenin and Norton theorem. Define a linear network. What do you mean by source transformation? 7
- b) Find the Thevenin equivalent of the circuit shown below at the terminal a-b. 10

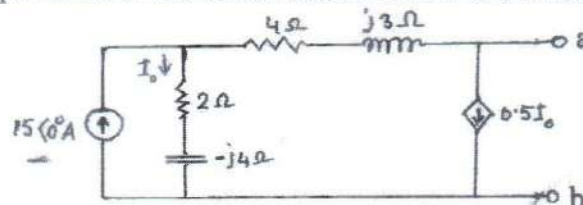


Figure 1: Figure for question 3.b.

- c) What are dependent and independent sources? What are the Thevenin and Norton equivalent of an AC circuit consist of? 8

4. a) What are Phasors? How would you represent a pure sinusoidal graphically by a phasor? 7  
Draw the phasor diagrams for a resistor, for an inductor and for a capacitor.
- b) A sinusoidal voltage is given by  $v(t) = 50 \cos(30t + 10^\circ)$  V. Find the followings: 10
- i. the amplitude  $V_m$
  - ii. the period  $T$
  - iii. the frequency  $f$ , and also  $v(t)$  at  $t = 10$  ms
- c) Transform the following sinusoids to Phasors: 8
- i.  $i = 6 \cos(50t - 40^\circ)$  A
  - ii.  $v = -4 \sin(30t + 50^\circ)$  V