University of Dhaka
Affiliated Engineering Colleges
Department of Computer Science and Engineering
1st Year 1st Semester B.Sc. Examination, 2020
EEE – 1103, Electrical Circuits

Total Marks: 70 Time: 2 Hours

(Answer any 3 (Three) of the following Questions)

1. a) Define open and short circuits with figures. 5
   b) State and explain Kirchhoff's voltage law (KVL) and Kirchhoff's current law (KCL). 5.33
   c) Find the equivalent resistance R_{ab} in the circuit of **Fig. 1**. 6

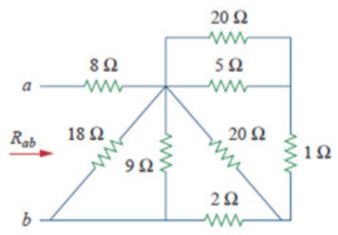

Fig. 1

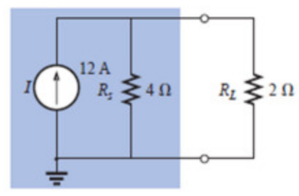

Fig. 2

   d) From the circuit of **Fig. 2** find 7
   (i) the current through 2 Ω resistor
   (ii) Convert the current source and 4 Ω resistor to voltage source and again solve for the current in 2 Ω resistor.

2. a) Find the nodal voltages at points **1** and **2** of the following circuit of **Fig. 3** 7.33

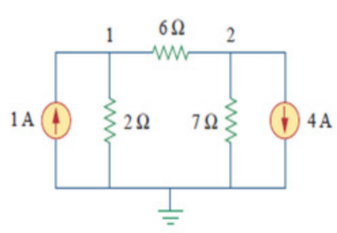

Fig. 3

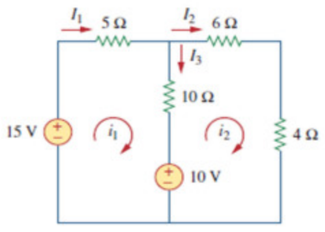

Fig. 4

   b) For the circuit in **Fig. 4**, find the branch currents I_1, I_2 *and* I_3 using mesh analysis. 8
   c) Using superposition, determine the current through 4 Ω resistor in **Fig. 5**. 8

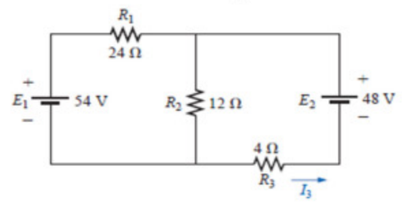

Fig. 5

3. a) State and explain superposition theorem. 4
   b) Prove that "Any two-terminal dc linear circuit can be replaced by an equivalent circuit consisting solely of a voltage source and a series resistor". 5.33
   c) Find the Thevenin equivalent circuit across the point **a** and **b** shown in **Fig. 6**. 7

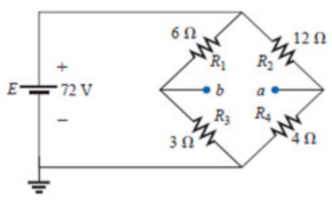

Fig. 6

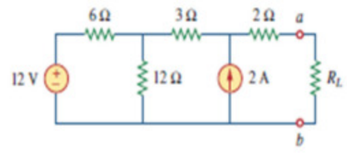

Fig. 7

   d) Find the value of R_L for maximum power transfer in the circuit shown in Fig.7. Also, find the maximum power. 7

4. a) Define time period and frequency. Also show their relationship. 4.33
   b) Define RMS value. Derive the RMS value equation for the sinusoidal ac voltage, $v(t) = V_m sin\omega t$ 6
   c) Define average power and power factor. Also derive the average power equation. 7
   d) Calculate the phase angle between $v_1 = -10cos(\omega t + 50^0)$ and $v_2 = -12sin(\omega t - 10^0)$. State which sinusoid is leading. 6

5. a) Classify capacitor and inductor. 4
   b) Derive the equation of energy stored in a capacitor. 6
   c) Derive the equivalent capacitor equation for N number of series connected capacitors. 6.33
   d) Find the equivalent capacitance seen between terminals *a* and *b* of the circuit in **Fig. 8**. 7

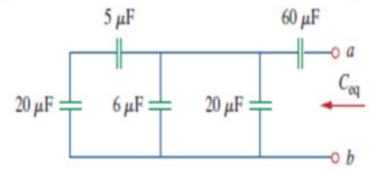

Fig. 8