L-1/T-1/EEE

Date : 23/12/2012

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1 B. Sc. Engineering Examinations 2010-2011

Sub : **EEE 101** (Electrical Circuits I)

Full Marks : 210 Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) Using mesh analysis, calculate the branch currents I_1, I_2, I_3, I_4 and I_5 for the circuit shown in Fig. for Q. 1(a). **(17)**

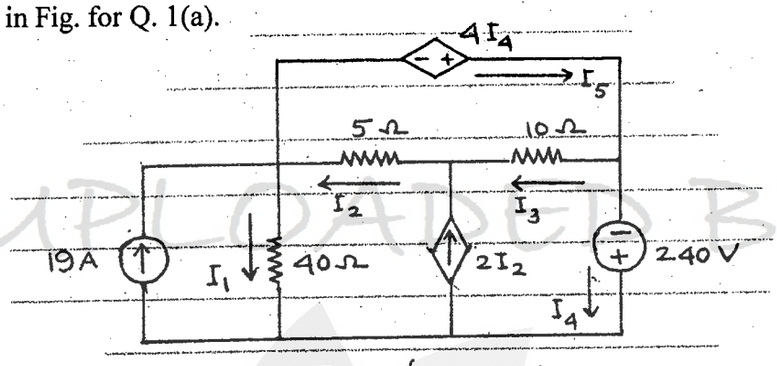

Fig. for Q. 1(a)

(b) Find I_o using nodal analysis for the circuit shown in Fig. for Q. 1(b). **(18)**

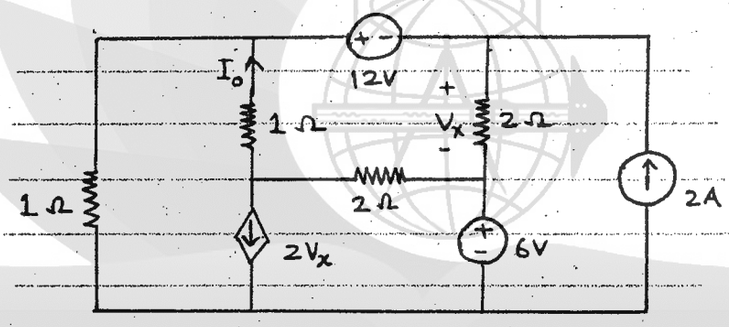

Fig. for Q. 1(b)

2. (a) Find the value of V_o using principle of superposition for the circuit shown in Fig. for Q. 2(a). **(17)**

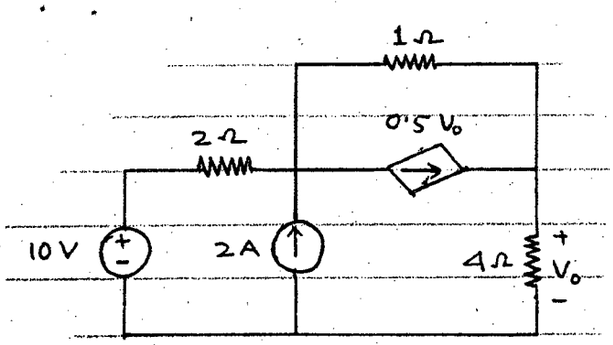

Fig. for Q. 2(a)

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(b) Find the value of V_x using source transformations for the circuit shown in Fig. for Q 2(b). **(18)**

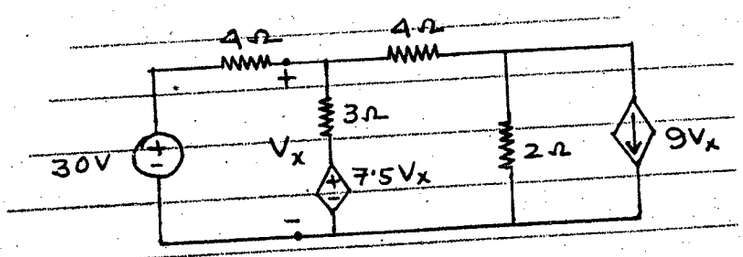

Fig. for Q. 2(b)

3. (a) Find the value of V_o using Thevenin's theorem for the circuit shown in Fig. for Q. 3(a). **(17)**

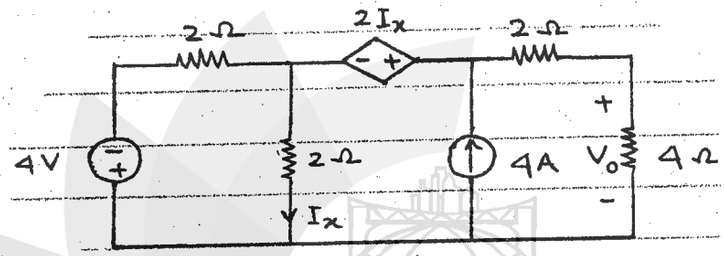

Fig. for Q. 3(a)

(b) The variable resistor (R_o) in the circuit shown in Fig. for Q. 3(b) is adjusted until the power dissipated in the resistor (R_o) is 250 W. Find the values of R_o which satisfy this condition. **(18)**

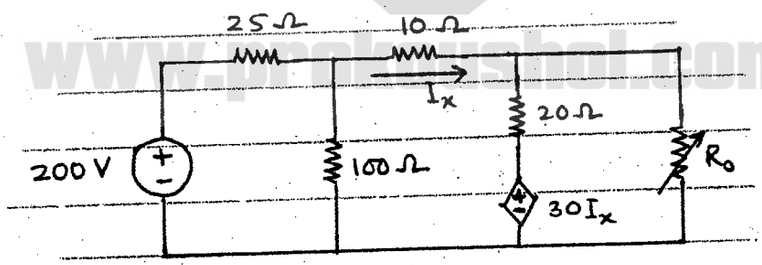

Fig. for Q. 3(b)

4. (a) Define the flux density, permeability and magnetizing force. **(9)**

(b) Explain the Ampere's Circuital Law. **(6)**

(c) Determine the value of current I required to establish a flux of $\phi 1 = 1.8 \times 10^{-4}$ Wb in the air gap in Fig. for Q. 4(c). **(20)**

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SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) Determine a numerical value for each current and voltage (i_1, v_1, etc.) in the circuit Fig. for Q 5(a). Also calculate the power absorbed by each element and verify that the sum to zero. **(20)**

   (b) Calculate R_{ab} for each of the networks shown in Fig. for Q. 5(b). **(15)**

6. (a) For the circuit of Fig. for Q. 6(a) **(15)**

   (i) Determine the output voltage V_{out} and output current I_{out}.

   (ii) Determine the voltage gain $|V_{out}/V_{in}|$.

   (b) Find R_{eq} and I in the circuit of Fig. for Q. 6(b). **(20)**

7. (a) Obtain expressions for both $i_1(t)$ and $i_2(t)$ as labeled in Fig. for Q. 7(a) which are valid for $t > 0$. **(17)**

   (b) The switch in Fig. for Q. 7(b) has been closed for a long time before opening at $t = 0$. Find **(18)**

   (i) $i_L(t)$, $t \geq 0$

   (ii) $v_L(t)$, $t \geq 0^+$

   (iii) $v_1(t)$, $t \geq 0^+$

8. (a) The current shown in Fig. for Q 8(a) is applied to a 0.5 μF capacitor. The initial voltage on the capacitor is zero. **(15)**

   (i) Find the charge on the capacitor at $t = 15$ μs.

   (ii) How much energy is stored in the capacitor by this current?

   (iii) Sketch v(t) over the interval $0 \leq t \leq 50$ μs.

   (b) Sketch the voltage $v_c(t)$ as shown in Fig. for Q. 8(b) for the interval $-0.5 \leq t \leq 40$ s. **(20)**

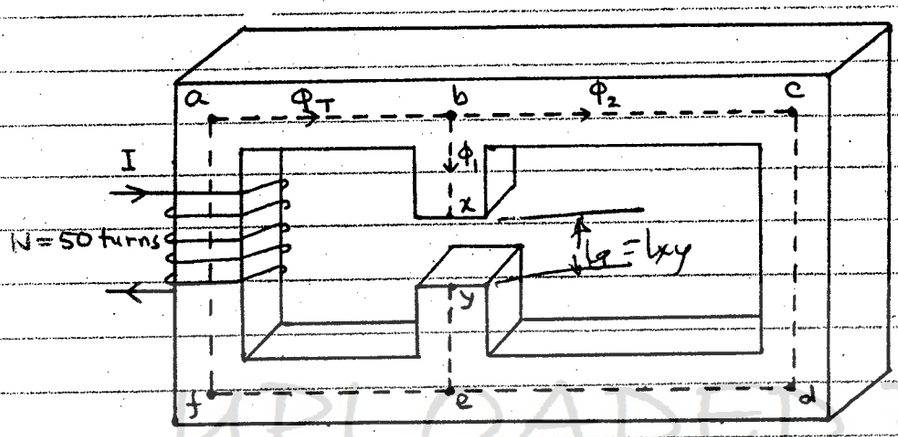

Fig. for Q. 4(c)

Given, Cross-sectional area (throughout), $A = 6 \times 10^{-4}\ m^2$

$l_{bcde} = 0.2\ m$

$l_{efab} = 0.1\ m$

$l_{bx} = l_{ey} = 2.5\ cm$

$l_g = l_{xy} = 0.2\ mm$

Material: sheet steel.

Fig. For Q. 4(c)

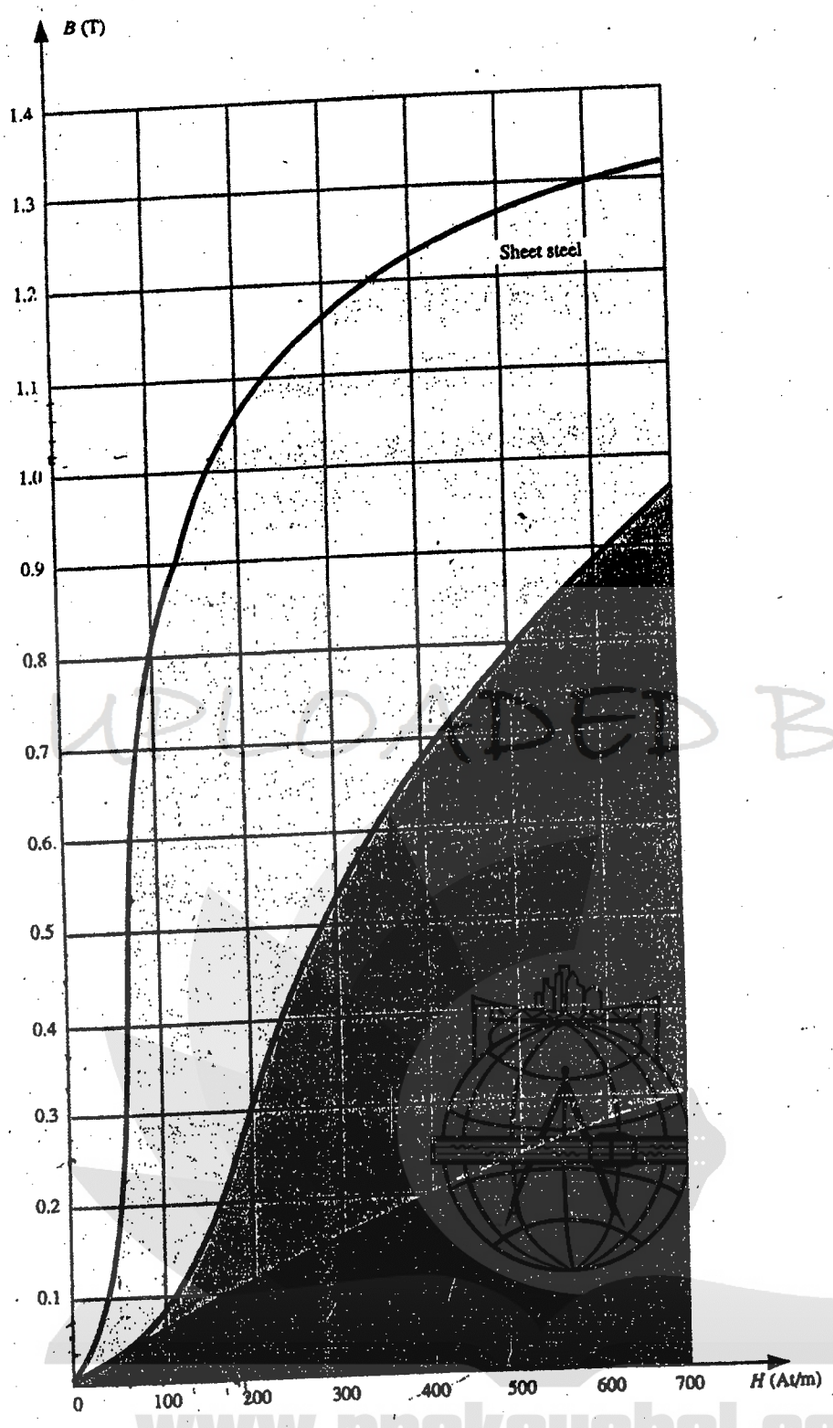

Fig. for Q. 4(c)

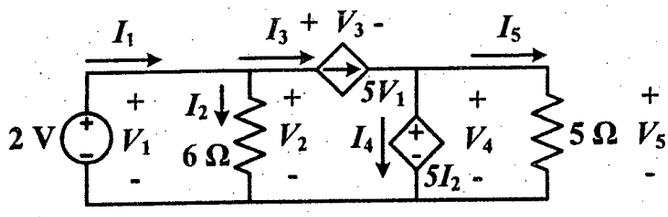

Fig. for Q. 5(a)

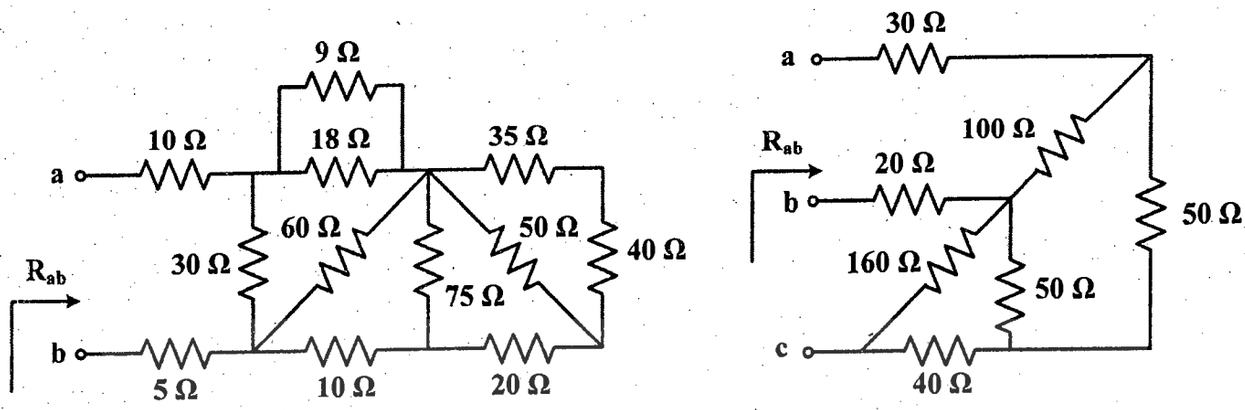

Fig. for Q. 5(b)

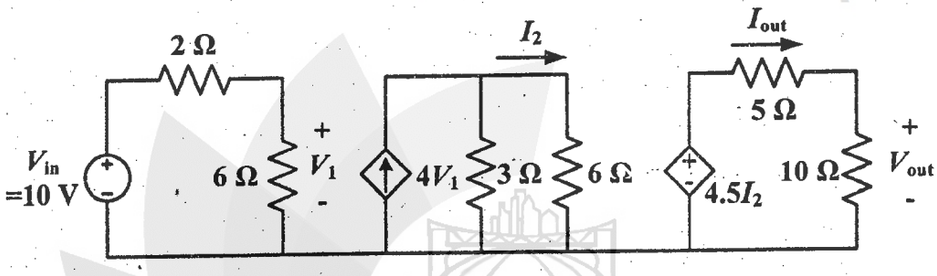

Fig. for Q. 6(a)

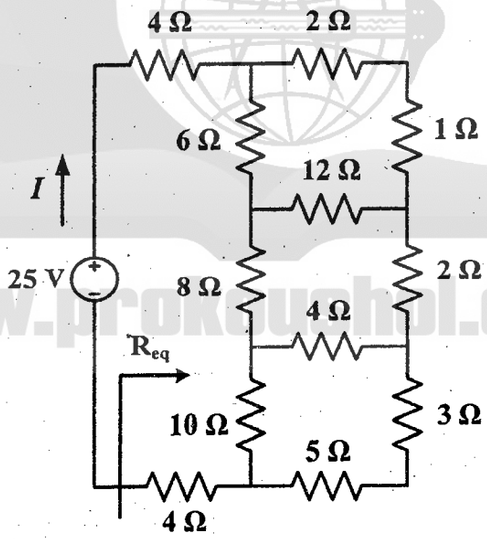

Fig. for Q. 6(b)

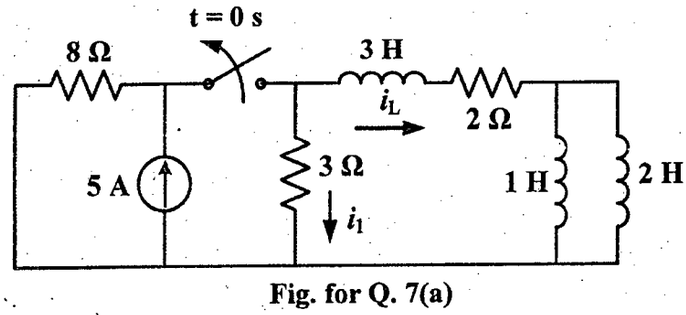

Fig. for Q. 7(a)

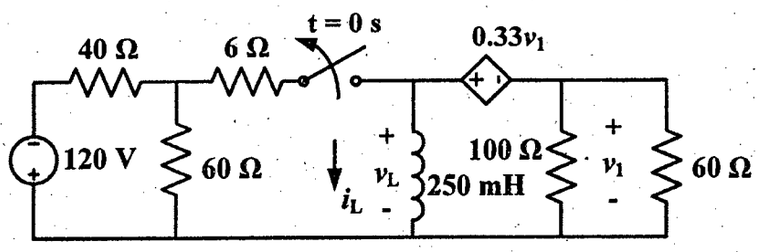

Fig. for Q. 7(b)

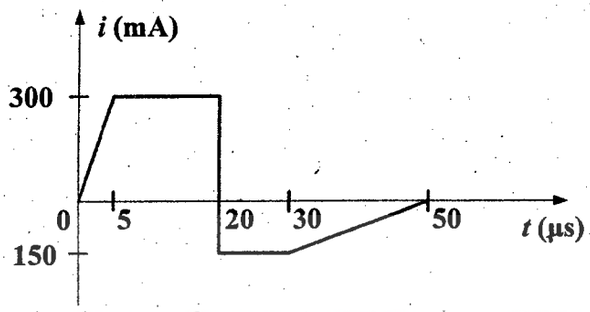

Fig. for Q. 8(a)

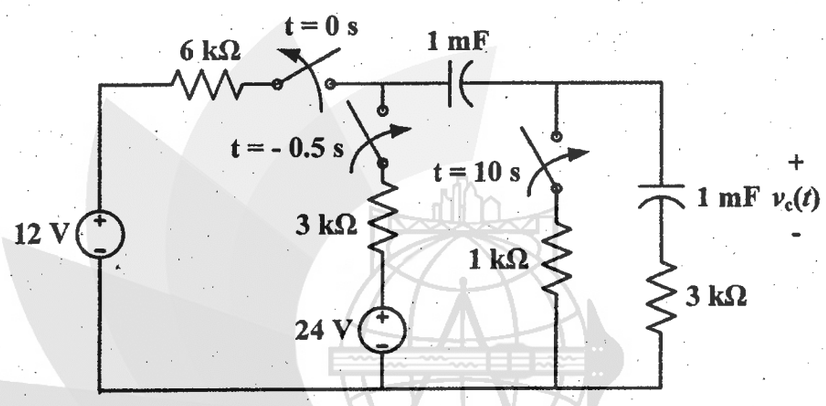

Fig. for Q. 8(b)