

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
 ORGANISATION OF ISLAMIC COOPERATION (OIC)
 DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Mid-Semester Examination
 Course No.: EEE 4201
 Course Title: Electrical Circuit II

Summer Semester A.Y. 2023-2024
 Full Marks: 120
 Time: 2 Hours

There are **04 (four)** questions. Answer **all 04 (four)** questions. The symbols have their usual meanings. Marks of each question and corresponding COs are written in the brackets.

- 1.a) With appropriate circuit diagram and waveshapes, formulate the step response equation of an RC Circuit and show the decomposition of the complete response in terms of the source and permanency. (15)
 (CO1)
- b) For the circuit in Figure 1, find the following: (15)
 (CO2)
- (a) $i_L(0^+)$, $v_C(0^+)$, and $v_R(0^+)$,
 (b) $di_L(0^+)/dt$, $dv_C(0^+)/dt$, and $dv_R(0^+)/dt$,
 (c) $i_L(\infty)$, $v_C(\infty)$, and $v_R(\infty)$.

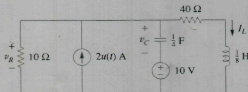


Figure 1

2.a) Express $h(t)$ in terms of the singularity functions.

(10)
(CO1)

$$h(t) = \begin{cases} 0, & t < 0 \\ -4, & 0 < t < 2 \\ 3t - 8, & 2 < t < 6 \\ 0, & t > 6 \end{cases}$$

b) For the circuit in Figure 2, find the Thevenin equivalent circuit at terminals a-b.

(10)
(CO2)

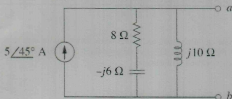


Figure 2

c) For the circuit in Figure 3, find $i(t)$ for $t > 0$.

(10)
(CO2)

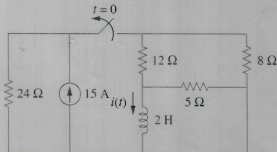


Figure 3

3.a) With appropriate circuit diagram and waveshapes, formulate the response equation of a source-free parallel RLC Circuit, briefly detailing all possible cases and parameters. (15)
(CO1)

b) Find the voltage $v_o(t)$ for $t > 0$ in the circuit of Figure 4. (15)
(CO2)

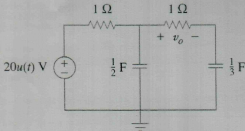


Figure 4

4.a) The switch in the circuit in Figure 5 is moved from position a to b at $t = 0$. Find $i(t)$ for $t > 0$. (15)
(CO2)

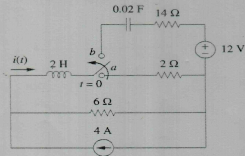


Figure 5

b) For the circuit in Figure 6, find the voltage $V_o(t)$ using Nodal Analysis.

(15)

(CO2)

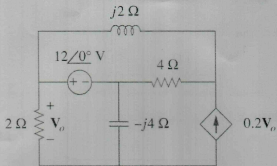


Figure 6