

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

Semester Final Examination
Course No.: Phy 4143
Course Title: Physics II

Winter Semester, A. Y. 2022-2023
Time: 3 Hours
Full Marks: 150

There are 6 (six) questions. Answer all 6 (six) questions. The symbols have their usual meanings. Programmable calculators are not allowed. Marks of each question and corresponding COs and POs are written in the brackets.

1. a) For the network in Fig. 1(a), find the current, voltage, and power associated with the 20-k Ω resistor.

7
(CO2,
PO2)



Fig. 1(a)

- b) In the circuit shown in Fig. 1(b), determine v_x and the power absorbed by the 12- Ω resistor.

8
(CO2,
PO2)

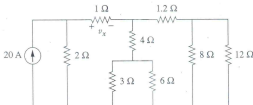


Fig. 1(b)

- c) Determine the value of voltage drop V in the circuit of Fig. 1(c).

10
(CO2,
PO2)

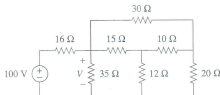


Fig. 1(c)

2. a) For the circuit in Fig. 2(a), find v_1 and v_2 using nodal analysis.

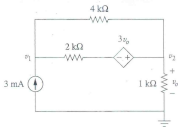


Fig. 2(a)

- b) Using mesh analysis, find current i in the circuit of Fig. 2(b).

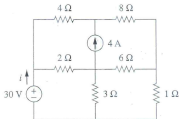


Fig. 2(b)

- c) Determine the node voltages in the circuit in Fig. 2(c) using nodal analysis.

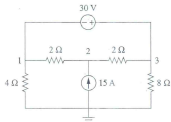


Fig. 2(c)

3. a) Using the superposition principle, find i_o and v_o in the circuit of Fig. 3(a).

12
(CO2,
PO2)

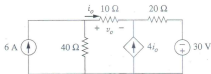


Fig. 3(a)

- b) Find the Norton equivalent circuit at terminals a - b for the circuit in Fig. 3(b).

13
(CO2,
PO2)

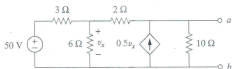


Fig. 3(b)

4. a) Find v_x for the circuit in Fig. 4(a) using source transformation. Show all the steps.

7
(CO2,
PO2)

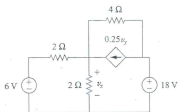


Fig. 4(a)

- b) Find the Thevenin equivalent circuit at terminals a - b for the circuit given in Fig. 4(b).

8
(CO2,
PO2)

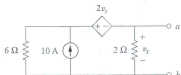


Fig. 4(b)

- c) Find the maximum power that can be delivered to the resistor R in the circuit of Fig. 4(c).

10
(CO2,
PO2)

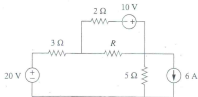


Fig. 4(c)

5. a) Sketch the phasor diagram representing voltage-current relationship for an inductor and a capacitor. 5
(CO3,
PO2)
- b) Using proper diagrams, justify the statement, "The voltage across a capacitor and the current through an inductor cannot change abruptly". 8
(CO3,
PO2)
- c) Based on the circuits shown in Fig. 5(c), explain how the capacitor C (Case 1) and the inductor L (Case 2) behave with the variation of frequency f of AC source $v(t)$. Show necessary derivations and proper diagrams. (Here, $\omega = 2\pi f$) 12
(CO3,
PO2)

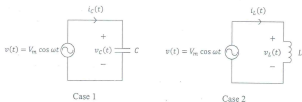


Fig. 5(c)

6. a) Find the impedance of the circuit in Fig. 6(a). Assume that the circuit operates at $\omega = 50$ rad/s. 7
(CO4,
PO2)

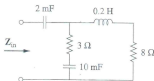


Fig. 6(a)

b) Determine the current $i(t)$ in the circuit of Fig. 6(b).

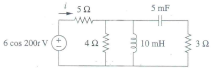


Fig. 6(b)

c) Find current I in the circuit of Fig. 6(c).

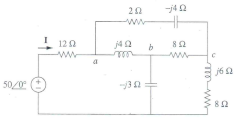


Fig. 6(c)