AIR FORCE INSTITUTE OF TECHNOLOGY
FACULTY OF ENGINEERING
ELECTRICAL ELECTRONIC ENGINEERING DEPARTMENT
FIRST SEMESTER EXAMINATION 2020/2021
BACHELOR OF ENGINEERING - 200 LEVEL
ELECTRICAL / AEROSPACE / AUTOMOTIVE / CIVIL / ICE / MECHANICAL / MECHTRONICS / MET & MAT / TELECOMS

Course Title:	APPLIED ELECTRICITY I
Course Code:	GET 201
Credit Unit:	2 Units
Instruction:	1. ANSWER ALL QUESTION 2. SHOW ALL WORKING AND WRITE DOWN THE CORRECT OPTION (SHOWING YOUR WORK FETCHES YOU THE FULL MARKS)
Duration:	2 HOURS
Date:	6th August 2021

SECTION A

Given that a coil has a resistance of 30Ω and an inductance of 0.5H. If the current flowing through the coil is 4amps as shown in Figure 2. Answer questions ***1 through 6*** *if the frequency of the supply voltage is 50Hz*

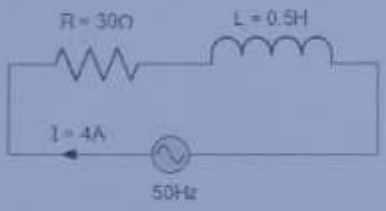

Figure 1

1. Calculate the Inductive reactance.
A. 130Ω
B. 157Ω
C. 328Ω
D. 211Ω
2. What is the impedance?
A. 136.6Ω
B. 15.7Ω
C. 159.8Ω
D. 241Ω
3. Calculate the voltage drop across the resistor.
A. 120V
B. 107V
C. 120.8V
D. 244V
4. Calculate the voltage drop across the inductor.
A. 628V
B. 640V
C. 120V
D. 300V
5. What is the supply voltage?
A. 628V
B. 640V
C. 120V
D. 300V
6. The estimated phasor angle?
A. 79.2°
B. 64°
C. 32°
D. 36.25°

Given capacitor which has an internal resistance of 10Ω and a capacitance value of 100uF is connected to a supply voltage given as $V_{in} = 100 \sin(314t)$ *as seen in Figure 3. Use the information to answer question* ***7 through 12.***

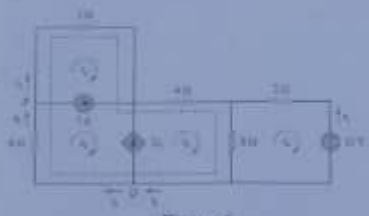

Figure 6

Figure 7

28. The analysis for the super meshes from the circuit in Figure 6 is given as:
    - A. $2i_1 + 4i_2 + 6i_3 - 8i_4 = 0$
    - B. $2i_1 + 6i_2 + 6i_3 - 4i_4 = 0$
    - C. $i_1 + 3i_2 + 6i_3 - 4i_4 = 0$
    - D. $i_1 + 3i_2 + 12i_3 - 4i_4 = 0$
29. The analysis for mesh 4 from the circuit in Figure 6 is given as :
    - A. $2i_4 + (8i_4 - i_3) + 20 = 0$
    - B. $5i_4 - 4i_3 = -5$
    - C. $2i_4 + 2(4i_4 - i_3) + 20 = 0$
    - D. $5i_4 - 4i_3 = -10$
30. The KCL for the dependent and independent current sources from the circuit in Figure 6 is given as (given $i_0 = -i_4$) :
    - A. $i_2 = i_3 - 3i_4$, $i_1 + 5 = i_2$
    - B. $i_3 = i_2 - 3i_4$, $i_1 + 5 = i_2$
    - C. $i_2 = i_3 - 3i_4$, $i_2 + 5 = i_1$
    - D. $i_2 = i_3 - 3i_4$, $i_2 + 5 = i_1$

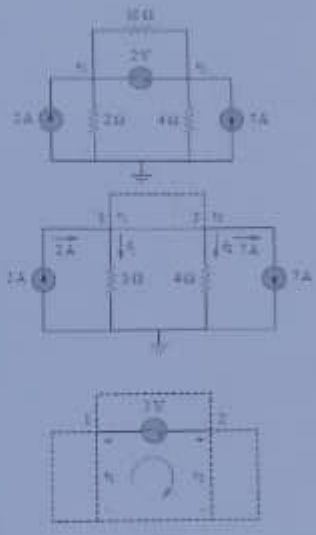

Figure 8

31. The analysis for the super node in the circuit in Figure 8 is given as
    - A. $2v_1 - v_2 - 28 = 8$
    - B. $v_1 = -20 + 2v_2$
    - C. $v_1 - 0.5v_2 - 14 = 4$
    - D. $v_2 = -20 - 2v_1$
32. The KVL analysis at the super node in the circuit in Figure 8 is given as:
    - A. $v_2 = v_1 - 2$
    - B. $v_2 = 2 + v_1$
    - C. $v_1 = v_2 + 2$
    - D. $2v_1 = 2v_2 + 4$
33. The node voltages v_1 and v_2 values respectively in the Figure 8 are
    - A. $v_1 = -7.333V$, $v_2 = -5.333V$
    - B. $v_1 = -14.333V$, $v_2 = -10.333V$

C. $v_1 = 7.333V$, $v_2 = 5.333V$

D. $v_1 = 14.333V$, $v_2 = 10.333V$

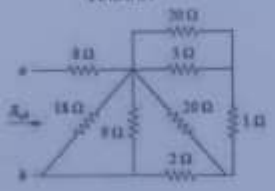

Figure 9

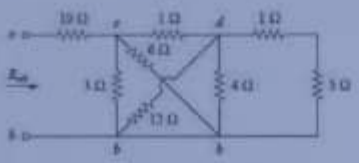

Figure 10

34. Determine the equivalent resistance in the Figure 9 above
    A. 12Ω
    B. 22 Ω
    C. 24 Ω
    D. 11 Ω
35. Find the equivalent resistance in the Figure 10 above
    A. 15.5 Ω
    B. 13.40 Ω
    C. 11.2 Ω
    D. 10.5Ω

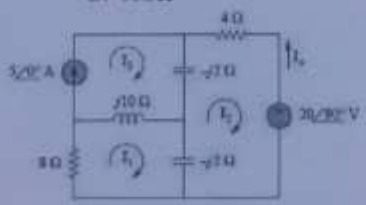

Figure 11

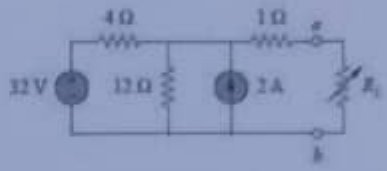

Figure 12

36. Using superposition theorem in the circuit in Figure 11 the analysis for mesh 2 when voltage source in the circuit is short circuit is given as
    A. $(4+j4)I_2 - j2I_1 - j2I_3 = 0$
    B. $(4+j2)I_2 - j2I_3 + j4I_3 = 0$
    C. $(4-j4)I_2 + j2I_1 + j2I_3 = 0$
    D. $(4-j4)I_2 + j4I_1 + j2I_3 = 0$
37. The analysis for mesh 1 as voltage source in the circuit in Figure 11 remain short circuit is given as:
    A. $(4-j4)I_1 + j5I_3 - jI_2 = 0$
    B. $(8+j8)I_1 - j10I_3 + j2I_2 = 0$
    C. $(4-j2)I_1 + j10I_3 - jI_2 = 0$
    D. $(8+j4)I_1 - j5I_3 + j2I_2 = 0$
38. The value for I_o when current source 5A is open circuit in the circuit in Figure 11 is given as
    A. $I_o = -2.353 + j2.353A$
    B. $I_o = -4.543 + j4.543A$
    C. $I_o = 5.556 - j5.556A$
    D. $I_o = -3.423 + j3.423A$
39. Find the Thevenin resistance (R_{TH}) and Thevenin voltage (V_{TH}) in the circuit in Figure 12
    A. 4Ω, 20V
    B. 2Ω, 10V
    C. 2Ω, 30V
    D. 4Ω, 30V
40. Find the value for Norton current I_N in the circuit in Figure 7 above
    A. 2A
    B. 0.5A
    C. 1A
    D. 1.5A