أولى نصف العام ٢٠٢٠

Menoufia University Faculty of Electronic Engineering Dept. Industrial Electronics and Control Eng. Course: Electrical Engineering Course Field: Specialization Requirements Academic Level: First Year, 1st Semester Academic Year: 2019 / 2020 Course Code: ACE 115		Final Term Exam Date: 16 / 1 / 2020 Exam Type: Written - C No. of Exam Pages: 4 No. of Exam Questions: 6 Exam Marks: 60 Marks Exam Time: 3 Hours From 10:00 AM to 1:00 PM

Answer the following questions:

Part – 1:

Question – 1: *Choose the correct answer for the following questions:* [9 Marks]

[1] The total charge that passes through a resistor in a period of 1.5 h, when a current of 500 mA flows is:

a) 750 C **b) 92.59 μC** **c) 2700 C** **d) 0.75 C**

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[2] An aluminum conductor has a resistance of 10 Ω at 20 °C and a temperature coefficient of 0.0039 per degree Celsius. The resistance of the conductor at 100 °C is:

a) 6.56 Ω **b) 13.12 Ω** **c) 131.2 Ω** **d) 26.24 Ω**

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[3] A current of 100 mA is supplied from a battery until a charge of 350 C is taken from the battery. The time for which the current must flow is:

a) 3.5 sec **b) 58.33 min** **c) 41.66 min** **d) 9.72 hours**

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[4] Suppose a power amplifier delivers 400 W to its speaker system. If the power loss is 509 W, then its efficiency is:

a) 78.58% **b) 44%** **c) 127.25%** **d) 88.71%**

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[5] An electric heater takes a current of 15 A when connected to a 120 V supply. The conductance of the heater is:

a) 0.1 S **b) 0.08 S** **c) 0.125 S** **d) 0.75 S**

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[6] A motor drives a pump through a gearbox as depicted in Figure 1. Power input to the motor is 1200 W. The output of the gearbox (and hence the input to the pump) is:

a) 1920 W **b) 192 kW** **c) 756 W** **d) 7.56 MW**

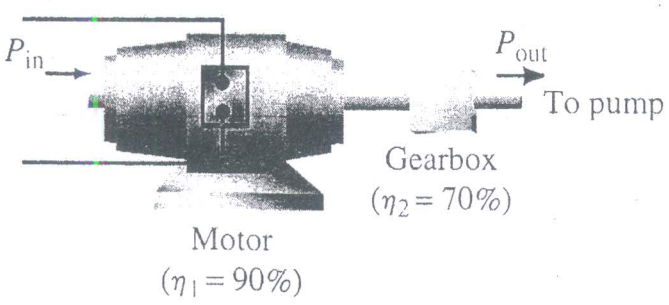

Figure 1

[7] For the non-ideal current source connected to a load resistance R_L:

a) $I_L = I$ b) $I_L < I$ c) $I_L > I$ d) $I_L = \infty$

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[8] A 12 V battery is to be used to establish an electric field strength of 750 V/m between two copper plates. The required distance between the plates is:

a) 9000 m b) 1.6 cm c) 62.5 m d) 16 cm

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[9] A field strength of 1000 V/m exists between two metal plates 1 cm apart in a vacuum. The applied emf on an electron passing between plates is:

a) 100 V b) 0.1 V c) 10 V d) 1000 V

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b) Put True (√) or False (×) signs for the following expressions: [3 Marks]

1. The kinetic energy possessed by an object is dependent upon mass and speed. ( )
2. In linear resistors, the current isn't directly proportional to the applied voltage. ( )
3. Voltage sources of different potentials should be connected in parallel. ( )
4. The internal resistance of the ammeter must be very large for less loading effect. ( )
5. $I_{OC} = 0$ for both the voltage source and the current source at open-circuit load. ( )
6. Mesh (Loop) equations for network analysis depends on Kirchhoff's current law. ( )

Question – 2: Consider the resistive network shown in Figure 2, Determine the current through the resistance R_3.

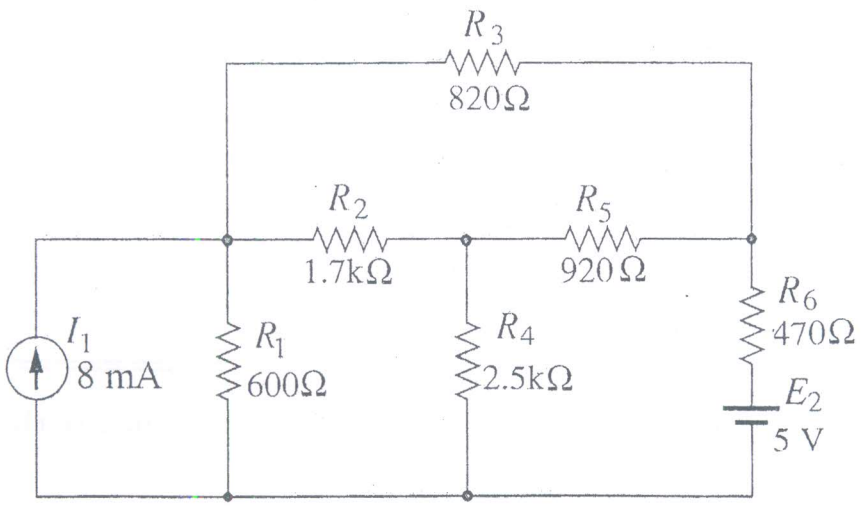

Figure 2 [9 Marks]

Question – 3: For the network shown in Figure 3, find the Norton's equivalent of the circuit external to load resistor R_L. Use the equivalent circuit to determine I_L when $R_L = 0$, $R_L = 2\ k\Omega$, and $R_L = 5\ k\Omega$.

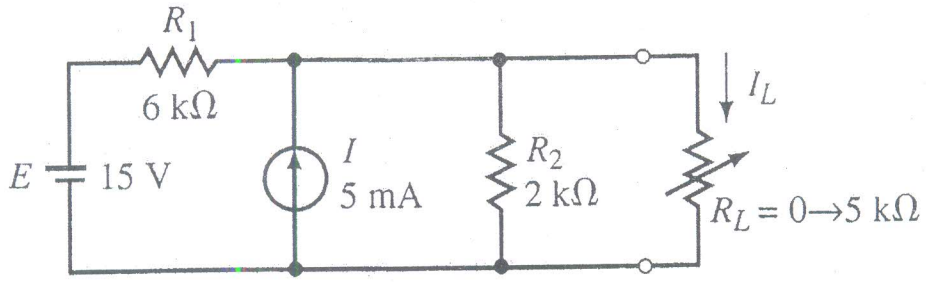

Figure 3 [9 Marks]

Part – 2:

Question – 4: **For the ac circuit shown in Figure 4, the capacitor is of C = 250 μF and the shown coil part impedance is given as 10 + j 31.4 Ω. If the ac input voltage is given as V_s = 7 sin(100πt),**

a. **Calculate the circuit current**

b. **Calculate the voltage V_R, V_L and V_C**

c. **Determine the power factor**

d. **Find the resonance frequency**

e. **Draw the phasor diagram for the circuit**

f. **Sketch the relation between the circuit impedance Z versus the frequency *f***

g. **If the coil is considered a pure conductance, determine the value of the average power at resonance frequency.**

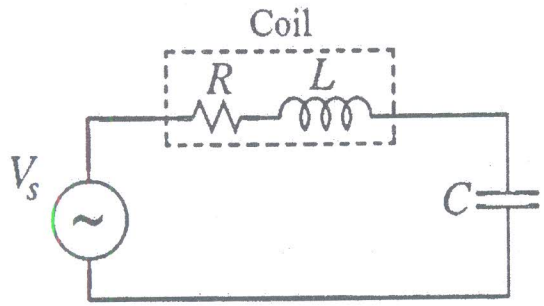

Figure 4 [10 Marks]

Question – 5: **A generator supplies power to an electric heater, an inductive element, and a capacitor as in the ac circuit shown in Figure 5,**

a. **Find P and Q for each load.**

b. **Find P_T and Q_T supplied by the generator.**

c. **Draw the power triangle for the combined loads.**

d. **Find the current supplied by the generator.**

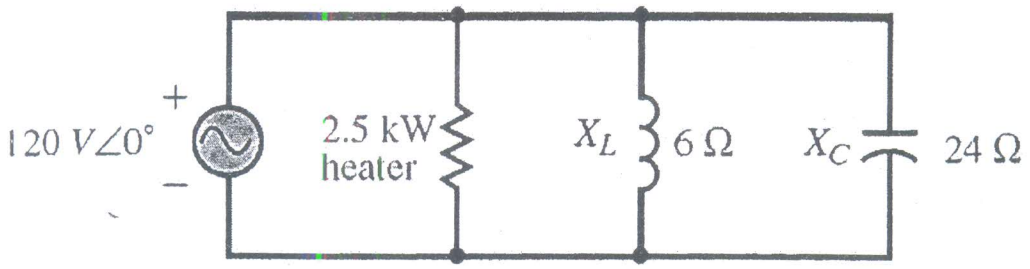

Figure 5 [10 Marks]

Question – 6:

a) Sketch the instantaneous sinusoidal waveforms of voltage V, current I and power P for:

i. **A purely resistive circuit.**

ii. **A purely inductive circuit.**

iii. **A purely capacitive circuit.** [3 Marks]

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b) For the circuit shown in Figure 6, if the supply voltage is given as $V_s = 117 \sin(120\pi t)$, Calculate the complex power and correct the power factor to be unity.

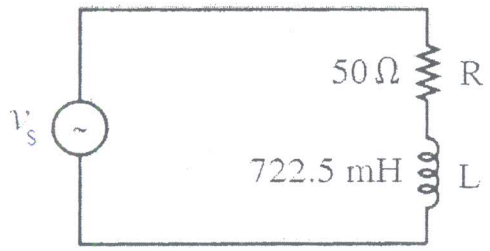

Figure 6 [7 Marks]

With best wishes