KATHMANDU UNIVERSITY
End Semester Examination
August, 2019

Mark Scored:

Level : B. E./B.Sc./B.Tech.
Year : I

Course : ENGG 112
Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date AUG 16 2019

SECTION "A"
[20Q × 1 = 20 marks]

Encircle the most appropriate answer. Symbols have their usual meaning.

1. A damaged 1500Ω resistor in a radio circuit is to be replaced, but the available resistors with you have are of 1000Ω only. For the replacement with 1000Ω resistors you would connect …
   a. three in parallel
   b. three in series
   c. two parallel and one in series
   d. two in series and one in parallel

2. In the following Figure 1, current flowing through the 30 Ohm resistor is_____

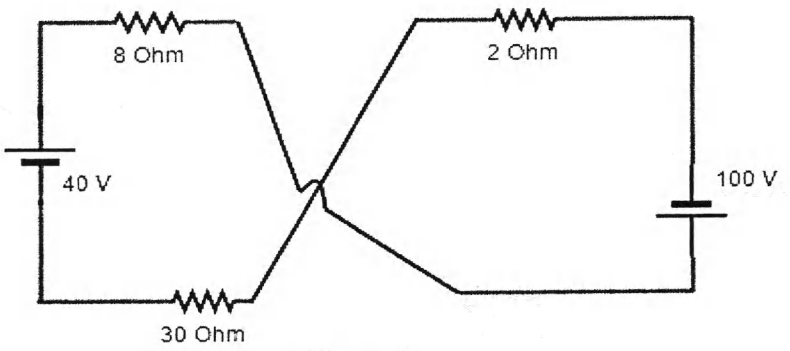


Figure 1

   a. 5.5A
   b. 3.5A
   c. 1.5 A
   d. 0.5 A

3. The total resistance for the given configuration is_____

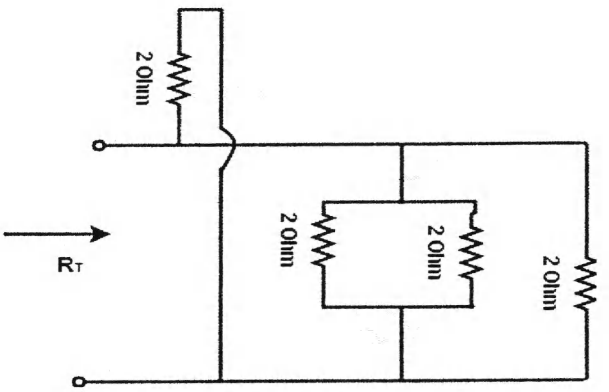


Figure 2

   a. 0.5 Ohm
   b. 3 Ohm
   c. 2 Ohm
   d. 3.5 Ohm

4. From the Figure 3, what are the values of V and I if the $R_2$ is shorted out?
   a. 6V, 0 A
   b. 0V, 3A
   c. 3V, 2 A
   d. 0V, 0.5 A

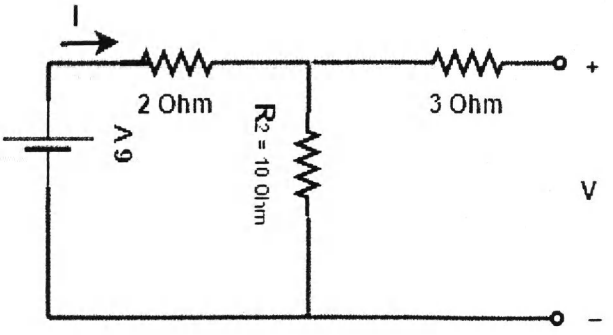


Figure 3

5. What is the value of current flowing through the load resistance ($R_L$)?

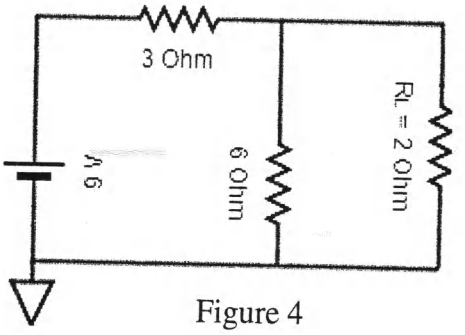


Figure 4

a. 0.06 A b. 0.3 A c. 0.5 A d. 1.5 A

6. The value of $R_L$ for maximum power transfer is .....

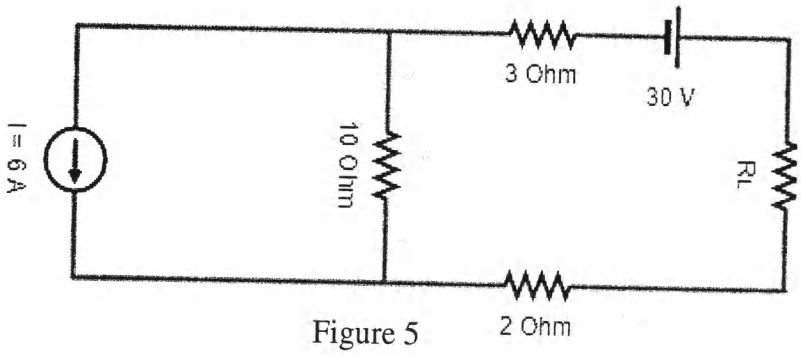


Figure 5

a. 13 Ohm b. 10 Ohm c. 12 Ohm d. 15 ohm

7. What is the value of magneto motive force (MMF) when the magnetic flux is 5 $W_b$ and the reluctance is 3 At/ $W_b$ ?

a. 15 At b. 1.67 At c. 10 At d. 3.8 At

8. The apparent power drawn by an ac circuit is 10kVA and active power is 8kW. The reactive power in the circuit is _____

a. 4 kVAR b. 6 kVAR c. 8 kVAR d. 16 kVAR

9. What is the phase relationship between the given sinusoidal waveforms?
V = 10 Sin ( $\omega t + 30^0$ ) and I = 5 Sin ( $\omega t + 70^0$)

a. V leads I by $70^0$ b. I leads V by $70^0$ c. V leads I by $40^0$ d. I leads V by $40^0$

10. The average value of the waveform shown in Figure 6 is _____

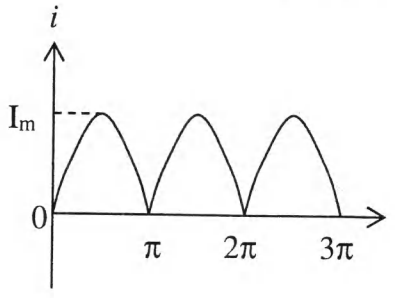


Figure 6

a. $\frac{I_m}{\pi}$ b. $\frac{2\,I_m}{\pi}$ c. 0 d. $\frac{I_m}{2}$

11. At what frequency will an inductor of 5 mH have the same reactance as a capacitor of 0.1 μF?
a. 2.13 KHz b. 5.67 KHz c. 7.12 KHz d. 9.32 KHz

12. In a R-L circuit, R = 35 Ω, L = 0.1 H. What is the magnitude of current flowing through the circuit if the magnitude of the applied voltage is 220 V?
a. 1.5 A b. 4.6 A c. 6.8A d. 10.7 A

13. The peak value of a sine wave is 200 V. The rms value is _____
a. 127.7 V b. 200 V c. 82.8 V d. 141.4 V

14. Which of the following expression is valid for three phase power?
a. $P = V_L I_L \text{Cos}\Phi$ b. $P = 3\ V_L I_L \text{Cos}\Phi$
c. $P = \sqrt{3}\ V_L I_L \text{Cos}\Phi$ d. $P = \frac{\sqrt{3}}{2}\ V_L I_L \text{Cos}\Phi$

15. Laminated core in electrical machines are used to reduce _____
a. Copper loss b. hysteresis loss
c. eddy current loss d. load power loss

16. The circuit element which opposes the change in ac circuit current is ....
a. resistor b. capacitor c. inductor d. diode

17. The power factor of single phase induction motor is usually _____
a. lagging b. leading
c. unity d. unity to 0.8 leading

18. In three phase delta connection _____
a. Line current is equal to phase current
b. Line voltage is equal to phase voltage
c. Line current is equal to phase voltage
d. Line voltage is equal to phase current

19. If $I_p$, $I_s$, $N_p$, $N_s$ represent primary current, secondary current, number of turns in primary side and number of turns in secondary side respectively, which of the following expression is correct for the transformer?
a. $\frac{I_p}{I_s} = \frac{N_p}{N_s}$ b. $\frac{I_p}{I_s} = -\frac{N_p}{N_s}$ c. $\frac{I_p}{I_s} = \frac{N_s}{N_p}$ d. $\frac{I_p}{I_s} = -\frac{N_s}{N_p}$

20. The function of commutator used in DC generator is _____
a. Amplification b. Switch
c. DC to AC conversion d. AC to DC conversion

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SECTION "B"

[5 Q. × 11 = 55 marks]

Attempt *ANY FIVE* questions. Assume suitable data where necessary. Symbols have their usual meaning.

1.

a) Ten lamps are to be connected in parallel in a drawing hall, to a 220V ac supply. There are two types lamps available, 60W incandescent lamp and 7watt LED lamps, both produces the same amount of light. A 60 watt incandescent light lamp costs 30 Nepali rupees (NPR) and it has an expected life span of 1000 hours. The LED lamp cost 250 NPR and has an expected life of 20,000 hours. Assuming the electricity costs to be 10 NPR/kWh, determine the total cost of running incandescent lamps versus LED lamps for 40,000 hours, for the drawing hall. Which lamp would you suggest for the drawing hall and why? [5]

b) Find the current $I_4$ and voltage $V_2$ for the given network shown in Figure 1. [6]

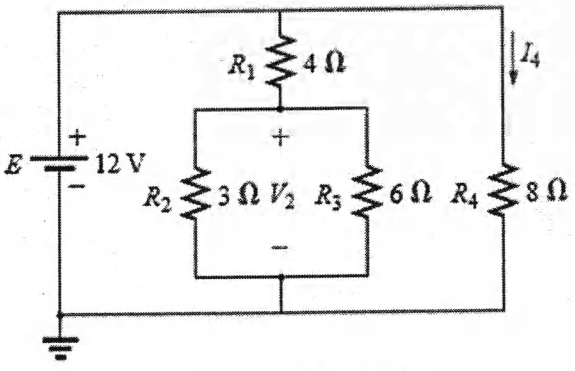


Figure 1

2.

a) Using mesh analysis, determine the current through the 5Ω resistor for given network shown in Figure 2. Also find the voltage V at node a. [5]

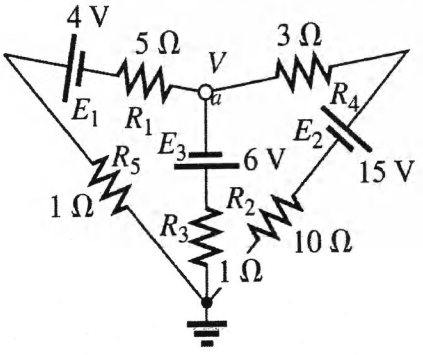


Figure 2

b) Find the total resistance $R_T$ of the Figure 3. [6]

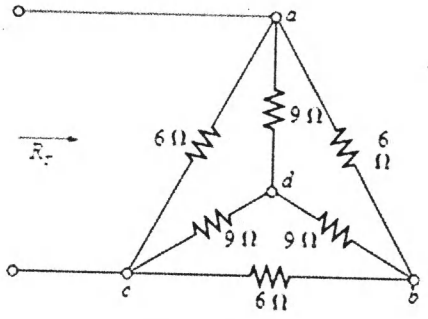


Figure 3

3.

a) Using superposition, find the current through the $R_1$ resistor for the given network shown in Figure 4. [5]

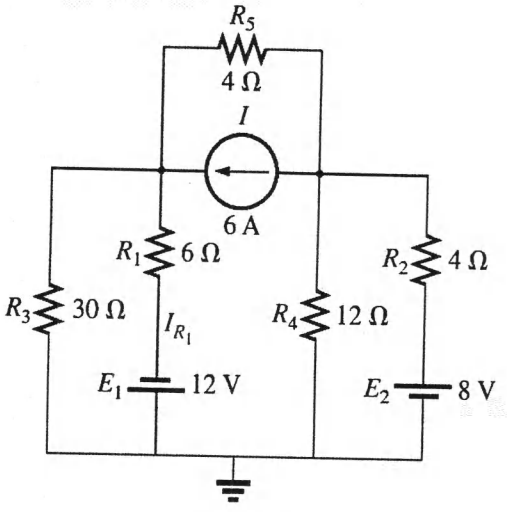


Figure 4

b) For the network shown in Figure 5, determine the Thevenin's equivalent circuit for the network external to the load resistance $R_L$. [6]

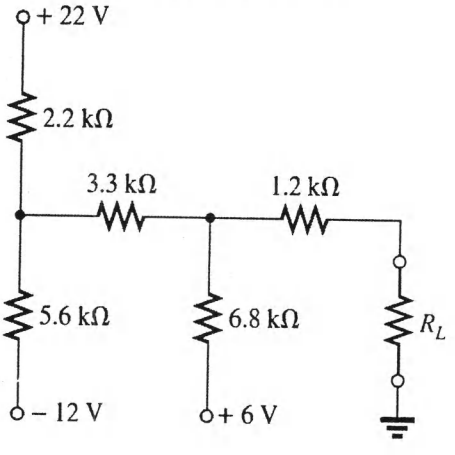


Figure 5

4.

a) Using nodal analysis, determine the voltage across the capacitive reactance in the circuit of the following Figure 6. [6]

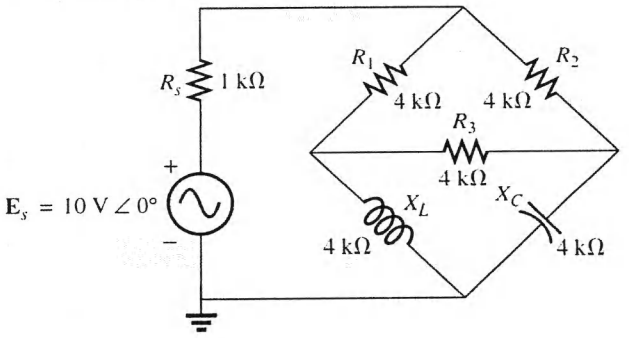


Figure 6

b) Derive an expression for resonating frequency in practical parallel RLC circuit. [5]

5.

a) A rectangular shaped core is made of mild steel plate having 15mm × 20 mm cross section area. The mean length of the magnetic path is 18 cm. The exciting coil has 300 turns and current 0.7 A. Calculate [4]

(i) Magnetizing force

(ii) Flux density

(iii) Reluctance

(iv) Flux of magnetic circuit. Assume relative permeability of mild steel as 940.

b) Find the RMS value of the periodic waveform of the following Figure 7. [3]

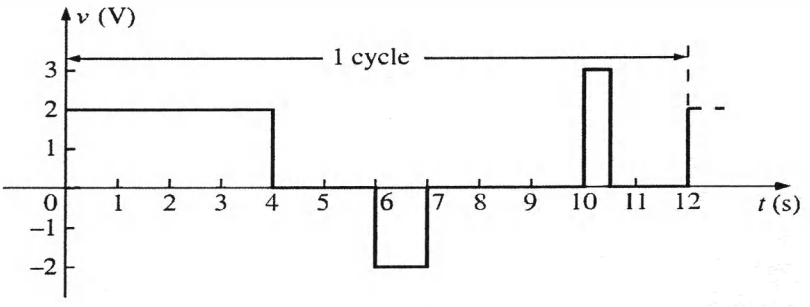


Figure 7

c) How is the resistance of conductor, insulator and semi-conductor affected by temperature? Explain with the help of suitable diagram and mathematical expression. [4]

6.

a) Explain the construction and operating principle of a DC generator. [5]

b) The phase sequence of the Y-connected generator in the following Figure 8, is ABC. [6]

(i) Find the phase angles $\Theta_2$ and $\Theta_3$

(ii) Find the magnitude of line voltages

(iii) Find the line currents

(iv) Verify that, since the load is balances, $I_N = 0$

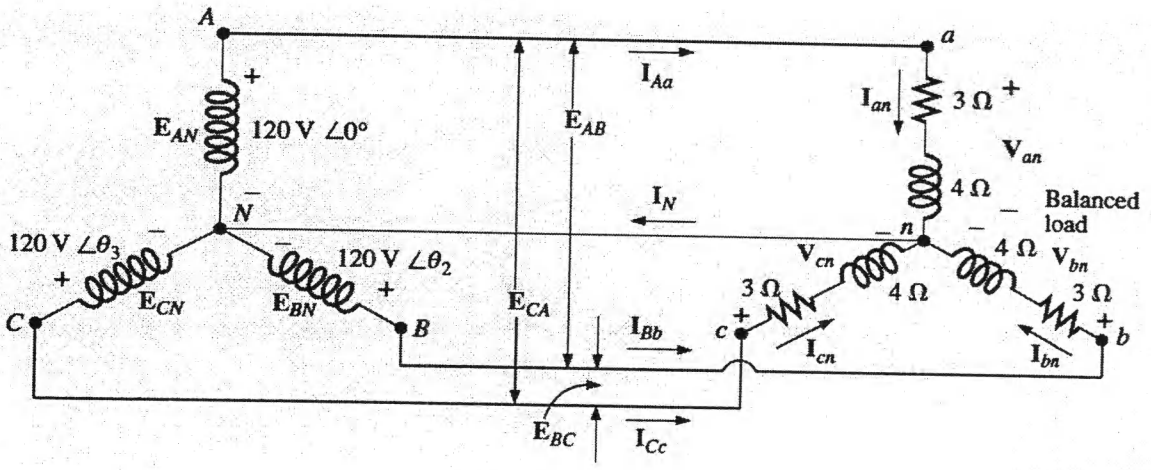


Figure 8