KATHMANDU UNIVERSITY
End Semester Examination
May/June, 2022

Marks Scored:

Level : B.E./B.Sc./B.Tech.
Year : I
Course : ENGG 112
Semester : II

Exam Roll No. :
Time: 30 mins.
F. M. : 10

Registration No.:
Date : 15-June-022

SECTION "A"
[20Q. × 0.5 = 10 marks]

Encircle the most appropriate option.

1. A damaged 1500 Ω resistor in a radio circuit is to be replaced, but the available resistors with you 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 series
   d. two in series and one in parallel

2. In a resistor, the color coding is given as follows 1st band: brown, 2nd band : black , 3rd band :black, 4th band, tolerance in %: gold . What is the value of resistance?
   a. 10Ω 1% tolerance
   b. 100Ω 1%tolerance
   c. 10Ω 5% tolerance
   d. 100Ω 5%tolerance

3. A good electric conductor is one that _____.
   a. Has low conductance.
   b. Is always made of copper wire.
   c. Produces a minimum voltage drop.
   d. Has few electrons.

4. The value of total resistance (R_T) of the given Figure 1 is _____.
   a. 4 Ω
   b. 6 Ω
   c. 8 Ω
   d. 10 Ω

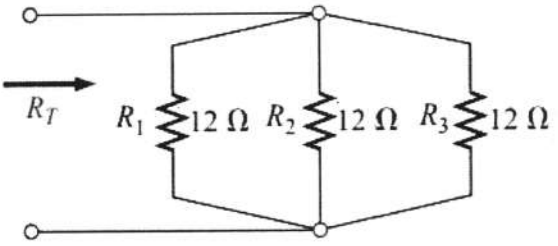

Figure 1

5. The load resistance needed to extract maximum power from the circuit as shown in Figure 2 is _____ Ohm.
   a. 2 Ohm.
   b. 9 Ohm.
   c. 6 Ohm.
   d. 18 Ohm.

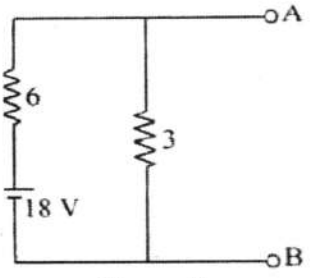

Figure 2

6. If the resistance of R_2 of the circuit as shown in Figure 3 becomes open circuited then the reading of the voltmeter will be _____.

a. Zero volts.
b. 150 volts.
c. 50 volts.
d. 200 volts.

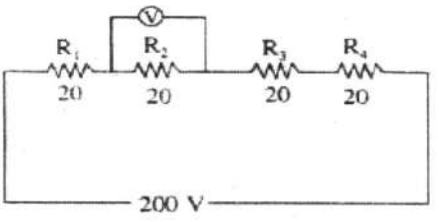

Figure 3

7. The voltage V_1 for the network in Figure 4 is _____.

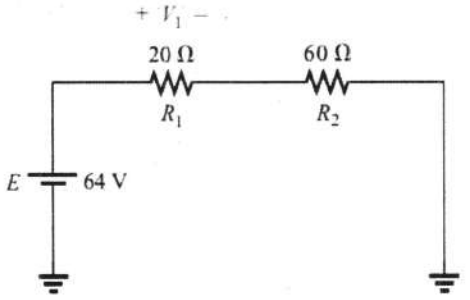

Figure 4

a. 10V b. 16V c. 20V d. 26V

8. The value of the Thevenin's voltage (V_{Th}) for the shaded region in Figure 5 is_____.

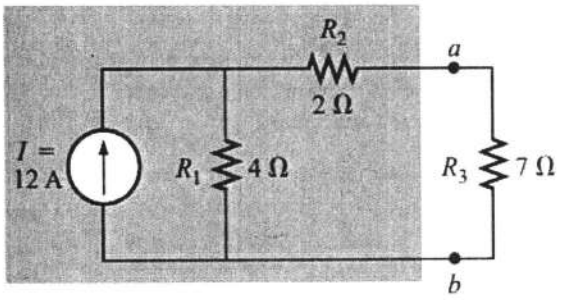

Figure 5

a. 20 V b. 32 V c. 48 V d. 56 V

9. Which of the following expression is valid for three phase power?

a. $P_T = V_L I_L \cos\theta$
b. $P_T = 3V_L I_L \cos\theta$
c. $P_T = \sqrt{3} V_L I_L \cos\theta$
d. $P_T = \frac{\sqrt{3}}{2} V_L I_L \cos\theta$

10. If $e_1 = A \sin\omega t$ amd $e_2 = B\sin(\omega t - \theta)$, then _____.

a. e_1 lags e_2 by θ
b. e_2 lags e_1 by θ
c. e_2 leads e_1 by θ
d. e_1 is in phase with e_2

11. An electrical load has a power factor of 0.8 lagging. It dissipates 8 KW at a voltage of 220 V. The impedance of this load in rectangular coordinates is _____.

a. $3.2 - j2.4$ b. $3.2 + j2.4$ c. $4 + j3$ d. $4 - j3$

12. If a sinusoidal wave has frequency of 50 Hz with 30 A RMS current, which of the following equation represent this wave?
a. 42.42 sin 314 t b. 60 sin 25 t c. 30 sin 50t d. 84.84 sin 25t

13. The reactance offered by a capacitor to an alternating current of frequency 50 Hz is 20 Ω. If frequency is increased to 100 Hz, then the reactance becomes _____ ohms.
a. 2.5 b. 5 c. 10 d. 15

14. The apparent power drawn by an AC circuit is 10kVA and active power is 8KW. The reactive power in the circuit is _____.
a. 2 kVAR b. 6 kVAR c. 8 kVAR d. 10 kVAR

15. The form and peak factor of the waveform as shown in Figure 6 will be _____.
a. 1.57 and 2 respectively
b. 2 and 1.57 respectively
c. 0 and 0
d. 0 and 1.11 respectively

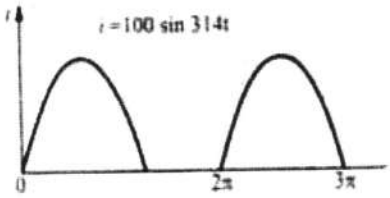

Figure 6

16. The voltages induced in the three windings of a 3 phase generator are _____ degree apart in time phase.
a. 120 b. 60 c. 90 d. 30

17. If the supply frequency of a transformer increases, the secondary output voltage of the transformer _____.
a. Increases b. Decreases
c. Remain the same d. Increases or decreases

18. An air gap is usually inserted in magnetic circuits to _____.
a. Increase MMF b. Increase flux
c. Prevent saturation d. Increase conductivity

19. A 12 Ω resistor, a 40 μF capacitor and an 8 mH coil are in series across an ac source. The resonant frequency is _____.
a. 25.1 Hz b. 281 Hz c. 2810 Hz d. 300 Hz

20. The induction generators deliver power at _____ power factor.
a. Lagging b. Leading c. Unity d. Zero

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SECTION "B"
[4Q. × 10 = 40 marks]

- ✓ *Attempt ANY FOUR questions.*
- ✓ *Assume any suitable data if necessary.*
- ✓ *Figures in margin indicate full marks for each questions.*

1. a. Convert voltage sources of Figure 1 into current sources and [5]
   i. Find the voltage V_{ab}
   ii. Find the magnitude and direction of the current I.

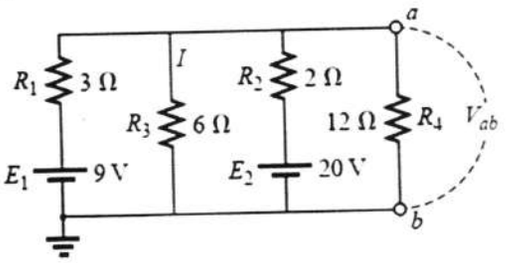

Figure 1

b. Calculate the indicated currents (I_S, I_5) and voltage (V_7) of Figure 2 [5]

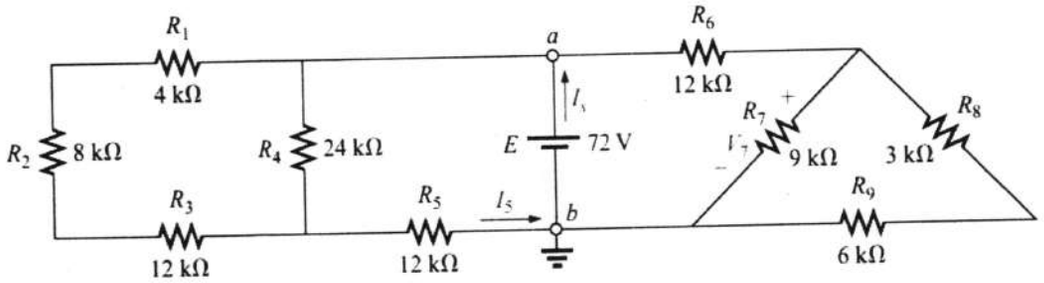

Figure 2

2. a. For the network shown in Figure 3, determine the Thevenin's equivalent circuit for the network external to the load resistance R_L [5]

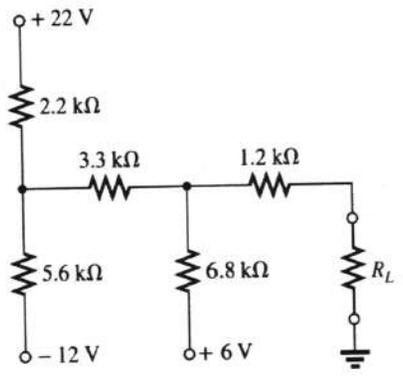

Figure 3

b. Using superposition, find the current through R_1 for each network in Figure 4. [5]

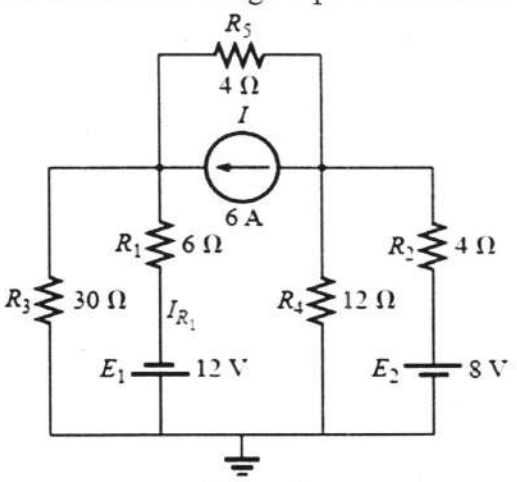

Figure 4

3. a. For the network in Figure 5 [5]

i. Find the total impedance Z_T.

ii. Determine the current I_s

iii. Calculate I_C using current divider rule.

iv. Calculate V_L using voltage divider rule.

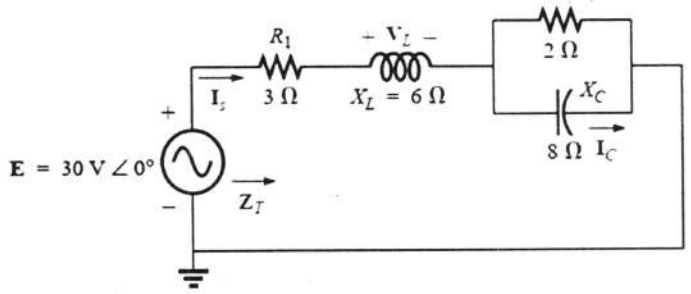

Figure 5

b. Find the value of I required to establish a magnetic flux of $\emptyset = 0.75 * 10^{-4}$ Wb in the series magnetic circuit of Figure 6. (Given $H_{cast-steel} = 280At/m$) [5]

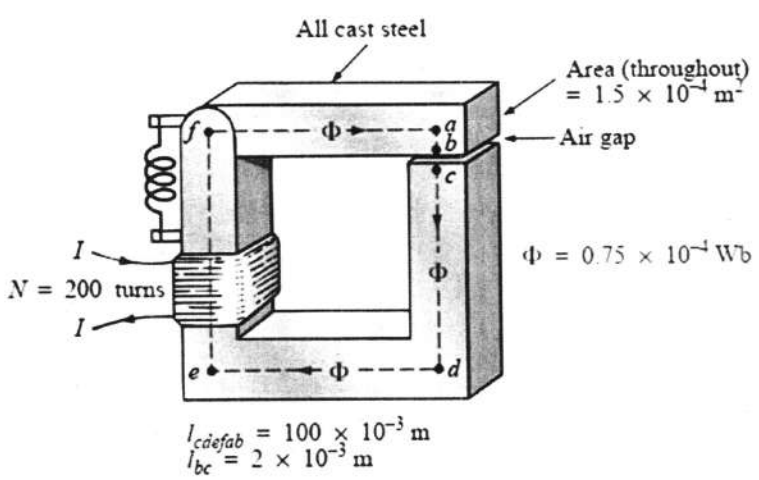

Figure 6

4. a. For the three-phase system of Figure 7: [5]

i. Find the phase angles Θ_2 and Θ_3.

ii. Find the current in each phase of the load.

iii. Find the magnitude of the line currents.

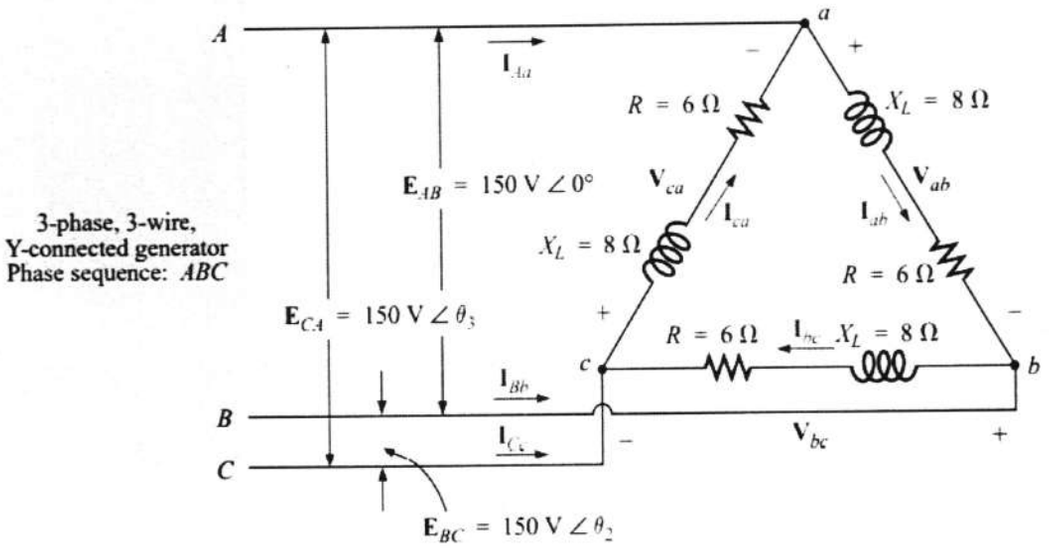

Figure 7

b. Find the average and r.m.s value of the periodic waveform as shown in Figure 8. [5]

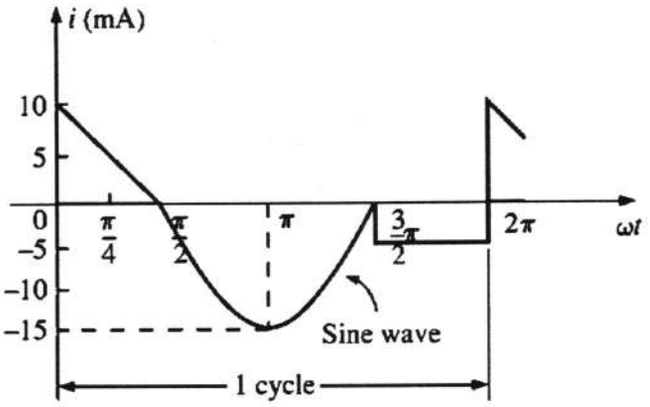

Figure 8

5. a. A series resonant circuit is having a resonant frequency of 6000 Hz and a Q of 15. Find

i. Bandwidth [1]

ii. Cutoff frequencies. [1]

If resistance of the circuit at resonance is 3Ω what are the values of

iii. X_L and in Ohms [1]

iv. X_C in Ohms [1]

v. What is the power dissipated at the half-power frequencies if the maximum current flowing through the circuit is 0.5 A? [1]

b. Determine the voltages V_1 and V_2 of Figure 9 using the nodal analysis. [5]

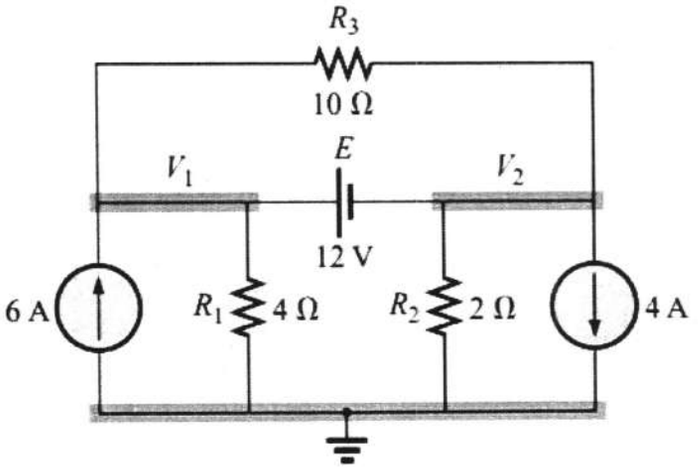

Figure 9