

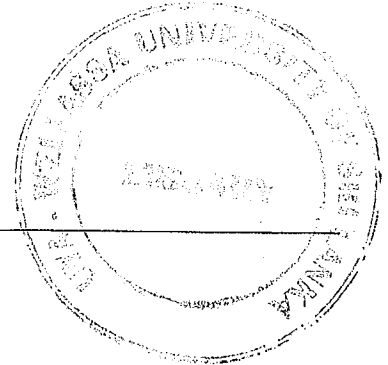
Instructions to candidates:

Duration: 2 Hours.

Number of questions: 04

Answer only two Questions.

Mark allocation: 100 marks



1. There are two types of transformers. They are,

- i. Step up transformers
- ii. Step down transformers.

a. For each type of transformers, state the relationship between secondary voltage V_s and primary voltage V_p .

(10 marks)

b. For an ideal transformer, ratio of primary voltage to secondary voltage $\frac{V_p}{V_s}$, is equal to,

$$\frac{V_p}{V_s} = \frac{N_p}{N_s} = \frac{I_s}{I_p}$$

c. Identify the terms N_p , N_s , I_s and I_p .

(20 marks)

d. For a single phase transformer, number of turns in primary coil is 2400, and number of turns in secondary coil is 120.

iii. What is the type of this transformer? (Step up or step down) Give reasons to your answer.

(10 marks)

iv. If an input of 240 V is supplied to above mentioned transformer, calculate the output voltage of the transformer.

(10 marks)

2. Household outlets produce alternating current (AC), but batteries produce direct current (DC).

a. Explain the difference between direct current and alternative current.

(10 marks)

b. Briefly state what is known as the rectification.

(5 marks)

c. What is the characteristic of the diode which is useful for rectification?

(5 marks)

d. Consider the circuit in figure 01 for the following questions,

- i. If V_{in} vs time graph is sinusoidal as shown in the figure 02, draw the expected V_{out} vs time graph.

(10 marks)

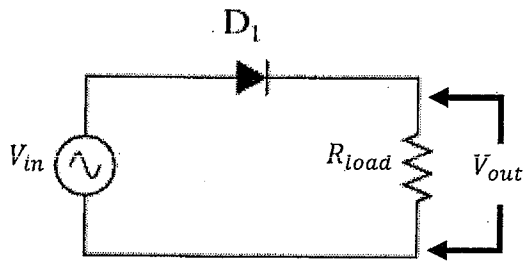


Figure 01

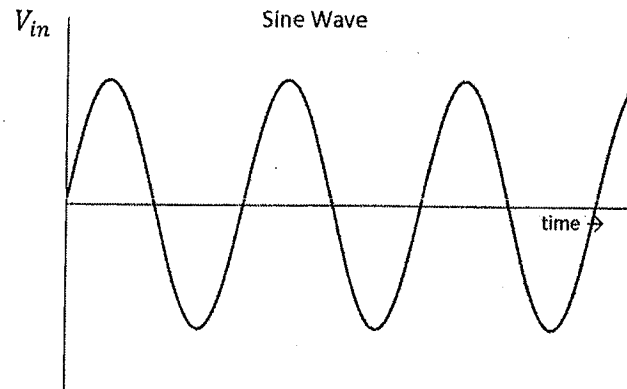


Figure 02

e. Suppose smoothing capacitor was connected parallel to the load resistor,

- i. Draw the circuit diagram for the new circuit.

(10 marks)

- ii. Draw the expected V_{out} vs time graph for the new circuit.

(10 marks)

3. For a single phase AC circuit, real power can be expressed as,

$$P_{real} = S \cos(\phi)$$

- a. Identify the terms S and $\cos(\phi)$.

(10 marks)

- b. Write down the expression for reactive power (P_{reac}) in terms of apparent power and phase difference (ϕ) between voltage and current.

(10 marks)

- c. A single phase motor, operating with a 400 V supply, is producing 10 kW power with a power factor of 0.7. Calculate,

- i. The input apparent power.

(10 marks)

- ii. Reactive power.

(10 marks)

- iii. Input current.

(10 marks)

4.

a. For the circuit shown in figure 03, calculate

i. The resultant resistance of the circuit.

(10 marks)

ii. The input current.

(10 marks)

iii. The power dissipated by the circuit.

(10 marks)

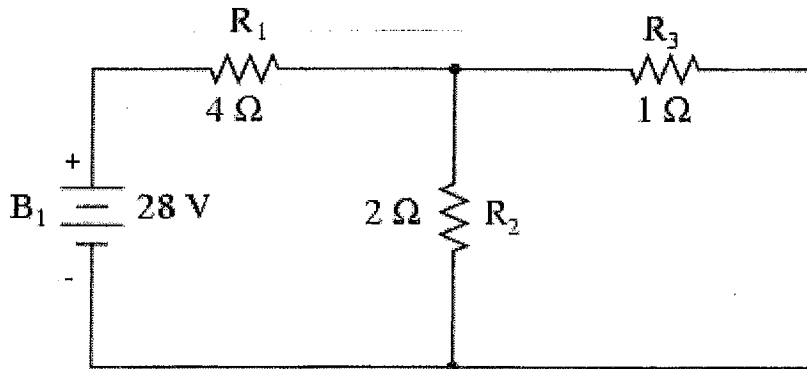


Figure 03

b. For the circuit shown in figure 04, calculate

i. The voltage at point A.

(10 marks)

ii. The current I through the $2\ \Omega$ resistor.

(10 marks)

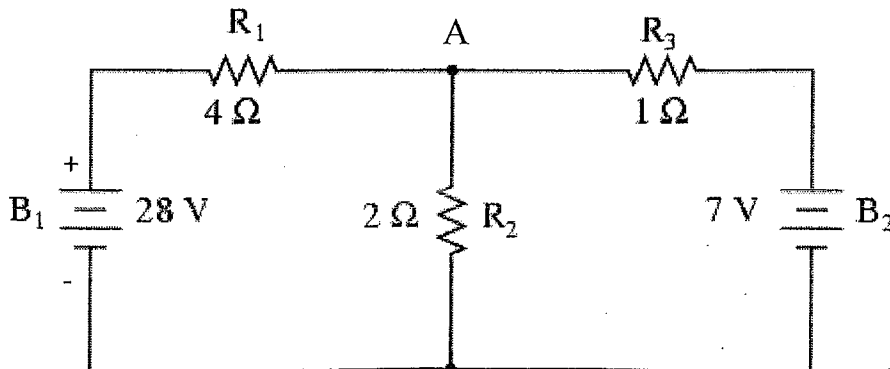


Figure 04

