

All symbols have their usual meaning, unless defined.

Scientific Calculators are allowed.

Duration: Two (02) hours

Number of questions: Four (04) Esseys

Mark allocation: 100

Answer all the questions

1.

- a. State Pascal's law and prove it using a wedge shape element in a fluid. (10 mark)
  
- b. A hydraulic press has ram of 30 cm diameter and a plunger of 4.5 cm diameter. Find the weight lifted by the hydraulic press when the force applied at the plunger is 500 N (Figure 01). (15 mark)

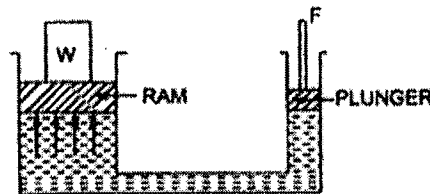


Figure 01

2.

- a. For the circuit shown in Figure 02, calculate
  - i. The current drawn from the supply (6 mark)
  - ii. The current through the  $6\ \Omega$  resistor (4 mark)
  - iii. The power dissipated by the  $5.6\ \Omega$  resistor (5 mark)

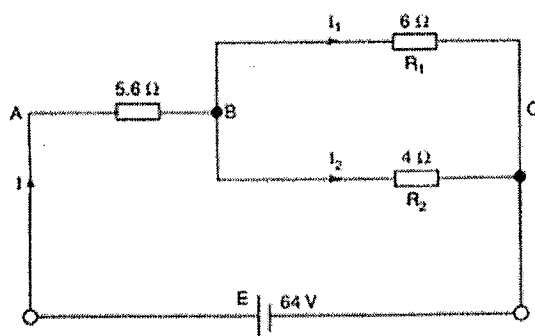


Figure 02

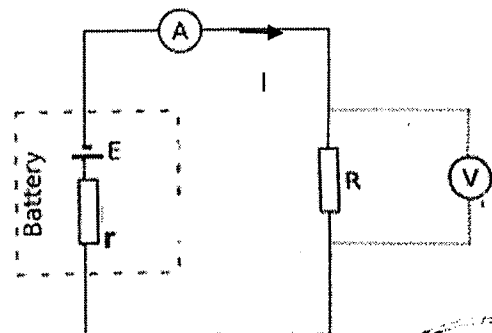


Figure 03



- b.
- Write down the equation to determine the internal resistance,  $r$  of the battery in Figure 03. (5 mark)
  - The potential difference across the terminals of a cell is 3.0 V when it is not connected to a circuit and no current is flowing. When the cell is connected to a circuit and a current of 0.37 A is flowing, the terminal potential difference falls to 2.8 V. Find the internal resistance of the cell. (5 mark)

3.

- a.
- Draw the charging and the discharging curves of the capacitor. (6 mark)
  - Determine the amount of charge stored on either plate of a capacitor with capacitance  $4 \times 10^{-6}$  F, when it is connected across a 12 V battery. (3 mark)
- b.
- A  $3 \mu\text{F}$  capacitor is charged from a 250 V d.c. supply. Calculate the charge and energy stored. (8 mark)
  - The charged capacitor is now removed from the supply and connected across an uncharged  $6 \mu\text{F}$  capacitor. Calculate the potential difference between the plates and the energy now stored by the combination of the capacitors. (8 mark)

4.

- a.
- Give the circuit diagrams of a half wave rectifier and a full wave rectifier. (6 mark)
  - Draw the output wave form of a half wave rectifier and a full wave rectifier for the input wave form given in figure 04. (4 mark)

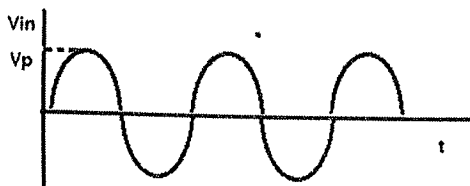


Figure 04

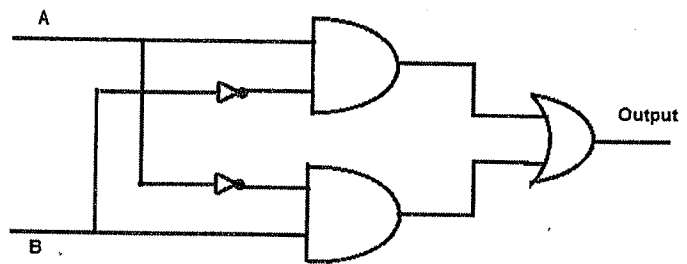


Figure 05

- b. Give the truth table and Boolean expression of the circuit given in Figure 05 and draw a single gate to replace it.

(15 mark)