

## GENERAL ENGINEERING

B

- I
1. Fineness, Soundness, Setting time, Compressive strength ( $4 \times 1/2$ )
  2. concrete structure, wooden structure, steel structure.
  3. Engage or disengage the engine from transmission system
  4.  $I \propto \sqrt{R}$  at constant temperatures
  5.  $GaAs$  [Gallium arsenic phosphide] for Red LED  
 $GaP$  [Gallium phosphide] for Green LED.

- II
1.
    - i Simple leveling
    - ii Differential leveling
    - iii Reciprocal leveling
    - iv Profile leveling
    - v Cross sectioning
    - vi Check leveling
    - vii Contouring
- a. ~~Dumpy level~~  
 b. ~~The wye level~~  
 c. ~~The reversible level~~  
 d. ~~The Tilting level~~
- (Army six) ( $6 \times 1 = 6$ )

- 2.
- i Shape should be uniform with standard size.
  - ii Colour of the brick should be uniform
  - iii It should have adequate hardness.
  - iv The brick should not absorb water.
  - v when two brick are struck with each other should produce metallic sound
  - vi when dropped from a height of one meter the brick should not break
  - vii should have a minimum compressive strength of  $5.5 \text{ N/mm}^2$
  - viii A good brick should have enough resistance of fire.
- (Army six) ( $6 \times 1 = 6$ )

### 3. Petrol Engine

- i. Petrol is mixed with fuel
- ii. Works on Otto cycle
- iii. Spark plug is used
- iv. Air fuel mixture enters the cylinder
- v. Light vehicles
- vi. Smooth running
- vii. High speed engines
- viii. Compression ratio range from 6 to 12
- ix. Efficiency is low

### Diesel Engine

- Diesel is mixed fuel  
works on Diesel cycle.  
Fuel pump/injector is used  
Fresh atmospheric air enters.  
Heavy vehicles.  
Rough running  
Low speed engine  
Compression ratio range from 15 to 22  
Efficiency is high,  
(Approx) (bx1 = 6)

- ### 4.
- i. It requires less space
  - ii. Absence of various links such as piston, piston rod etc
  - iii. Its over load capacity is large
  - iv. It can be designed for much greater capacity
  - v. The internal lubrication is not required.
  - vi. In steam turbine power is generated at uniform rate (bx1 = 6)

### 5. Resistivity

The property of a conductor which opposes the flow of electric current - Unit ohm

b. rms value.

The effective value of an alternating current is given by the direct current that produces the same heating effect in the same resistance

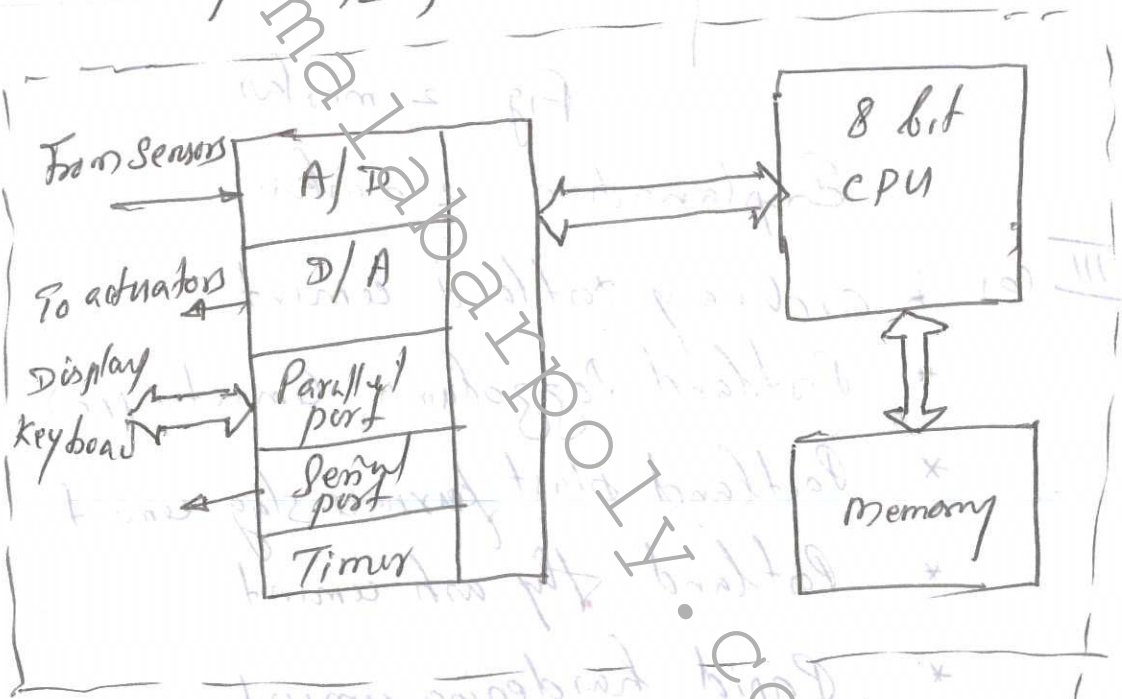
c. Power factor

$\cos \phi$  = cosine of the angle between voltage and current.

(3x2 = 6 marks)

$\cos \phi = R/Z$

6.



7.

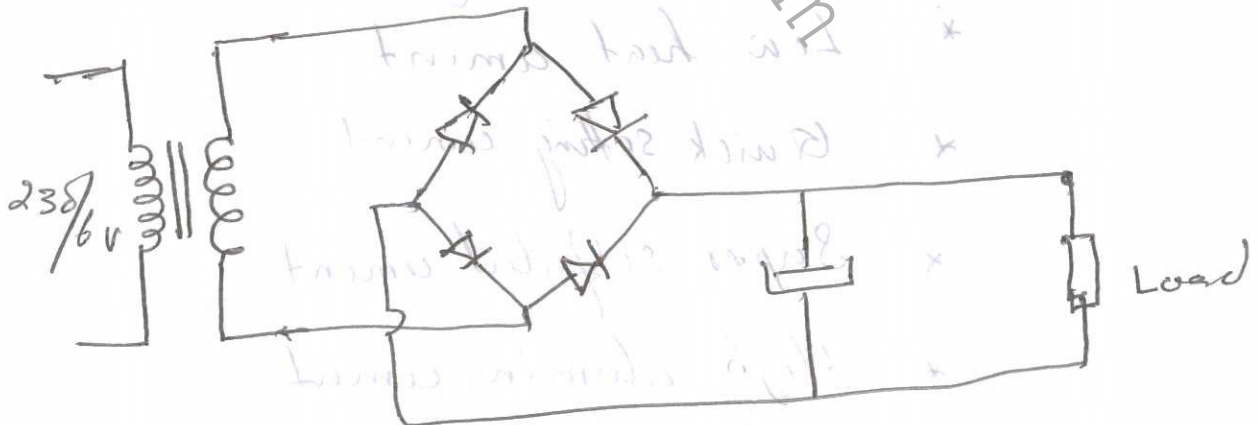
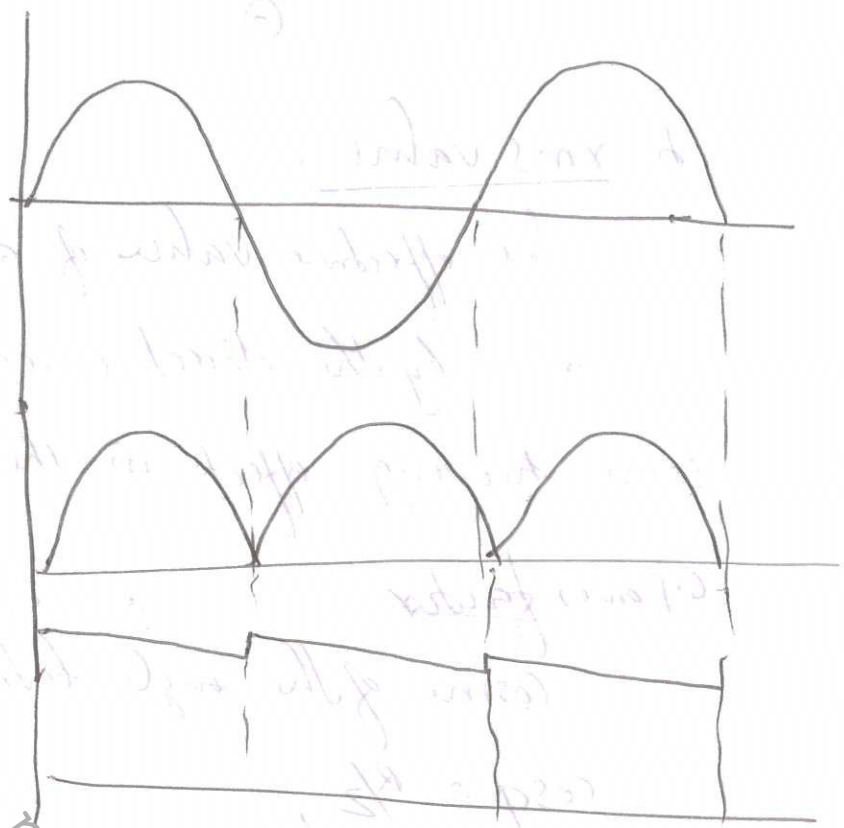


Fig: 2 marks



WWW.MTLT.PK Fig 2 marks

Explaining 2 marks.

- III (a) \*
- \* Ordinary portland cement
  - \* Portland Pozzolana cement (PPC)
  - \* Portland blast furnace slag cement.
  - \* Portland fly ash cement
  - \* Rapid hardening cement
  - \* Low heat cement
  - \* Quick setting cement
  - \* Super sulfated cement
  - \* High alumina cement
  - \* Coloured cement
  - \* White cement

(Any 8) (8x1=8)

- III (b)
- \* It should be sufficient strong and durable
  - \* It should be capable to bear the loads coming over it
  - \* It should not be deteriorated or decayed
  - \* It should not be affected by termites and insects
  - \* It should be damp resistant
  - \* It should be easily workable
  - \* The materials should be available.
  - \* It should be economical.

IV (a) \* It should be free from any organic vegetable matters.

\* Sand particles should be clean and coarse

\* It should be chemically inert

\* It should contain sharp angular and durable grains

\* It should contain particles of various size in suitable proportions

\* It should be strong and durable

\* It should be clean and free from coatings of clay and silt.

IV (b)

1. chain

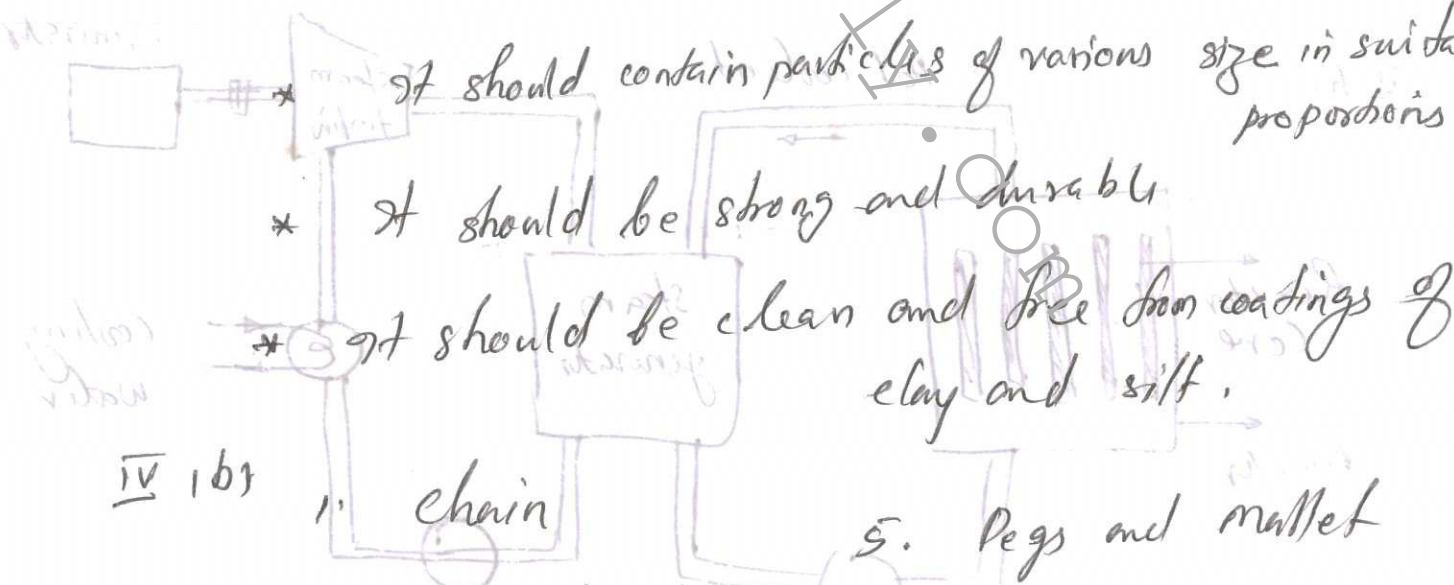
5. Pegs and mallet

2. Measuring tap.

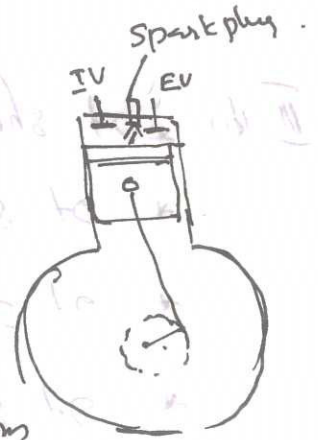
6. Cross staff

3. Ranging rods

4. Arrows



Q.9. There are four strokes in a petrol engine



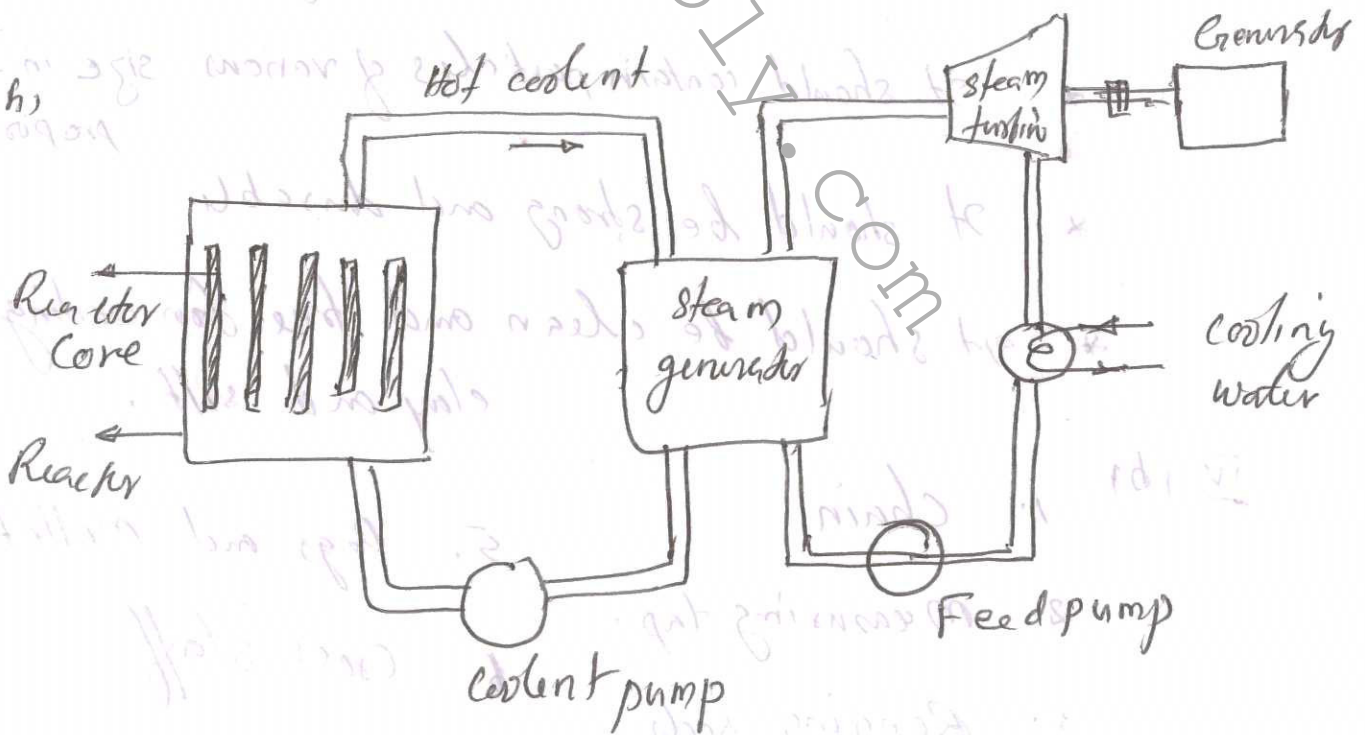
1. Suction Stroke when the piston moves from TDC to BDC Inlet valve opens and the air fuel mixture enters in to the cylinder.

2. Compression Stroke ∴ piston moves from BDC to TDC, both the valves remains closed, the air fuel mixture is compressed and at the end of compression a spark is produced by the spark plug and the air fuel mixture ignited.

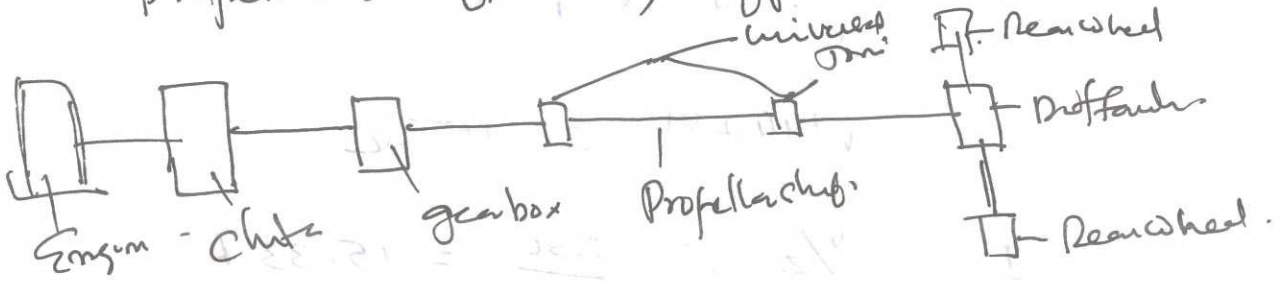
3. Power stroke: When the air fuel mixture is ignited the pr. and temp. inside the cylinder is increased and the piston is pushed down wards i.e. piston moves from TDC to BDC this stroke is called power stroke. The work is done by the system on the crank shaft.

4. Exhaust stroke: Piston travels from BDC to TDC the exhaust valve opens and the burned gas exhausted through the valve. when the piston reach at TDC a cycle is completed.

Q.10



VI (a) The main components of a power transmission system is clutch flywheel, clutch, gearbox, universal joint Propeller shaft and differential and Rear axle.



Clutch: Clutch is a device used to engage and disengage the engine from the transmission system.

Gearbox: Located between clutch and propeller shaft. It consists of sets of gears whose positions can be changed with the help of gear lever.

Propeller shaft with Universal Joint: It is located between gear box and differential. It consists of an arrangement to change the length of the shaft while the vehicle is running. Universal joint permits power transmission at any angle. Propeller shaft is connected to the differential with the help of universal joint.

Differential: It is located between propeller shaft and rear axle (half shaft). Differential is used when the vehicle is turning a curve.

Rear axle: It is not a single one. One end of each shaft is connected to the sun gear of differential.

- (b) Advantage: Water is cheap and reliable. No ash disposal problem and no air pollution. No fuel transportation problem, low maintenance cost. Life of plant is more. It requires less no. of staffs.
- Disadvantage: Lot of space is need as catchment area. In availability of rain,

VII a)

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$
$$= \sqrt{12^2 + (19 - 10)^2}$$
$$= \sqrt{144 + 81} = 15 \Omega$$

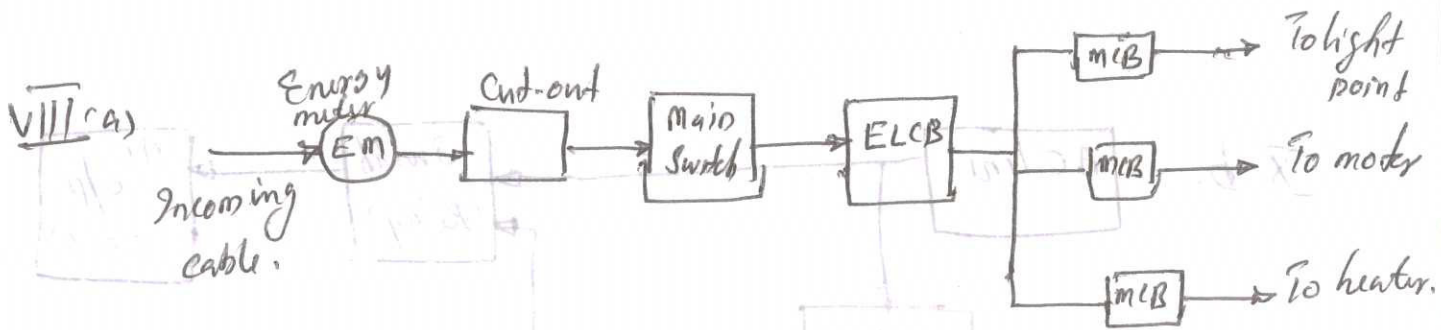
$$I = \frac{V}{Z} = \frac{230}{15} = 15.33 \text{ A}$$

$$\cos \phi = \frac{R}{Z} = \frac{12}{15.33} = 0.78$$

$$P = VI \cos \phi$$
$$= 230 \times 15.33 \times 0.78$$
$$= \underline{\underline{2760 \text{ W}}}$$

VII (b) MCB: Miniature circuit breaker is connected in the circuit to prevent the accidents due to short circuit or over current. Short circuit is prevented by tripping unit which consists of relay. Thermal overload protector (bimetal) to prevent over current. (3 marks)

② ELCB: Weakness and leakage of insulation may result in electric shock and other accidents when the element or ~~wiring~~ <sup>wiring</sup> of an appliances current leaks to its metal body which causes electric shock. This is called earth leakage. Earth leakage circuit breaker opens the circuit and cut off the power supply. (4 marks)



VIII (b)

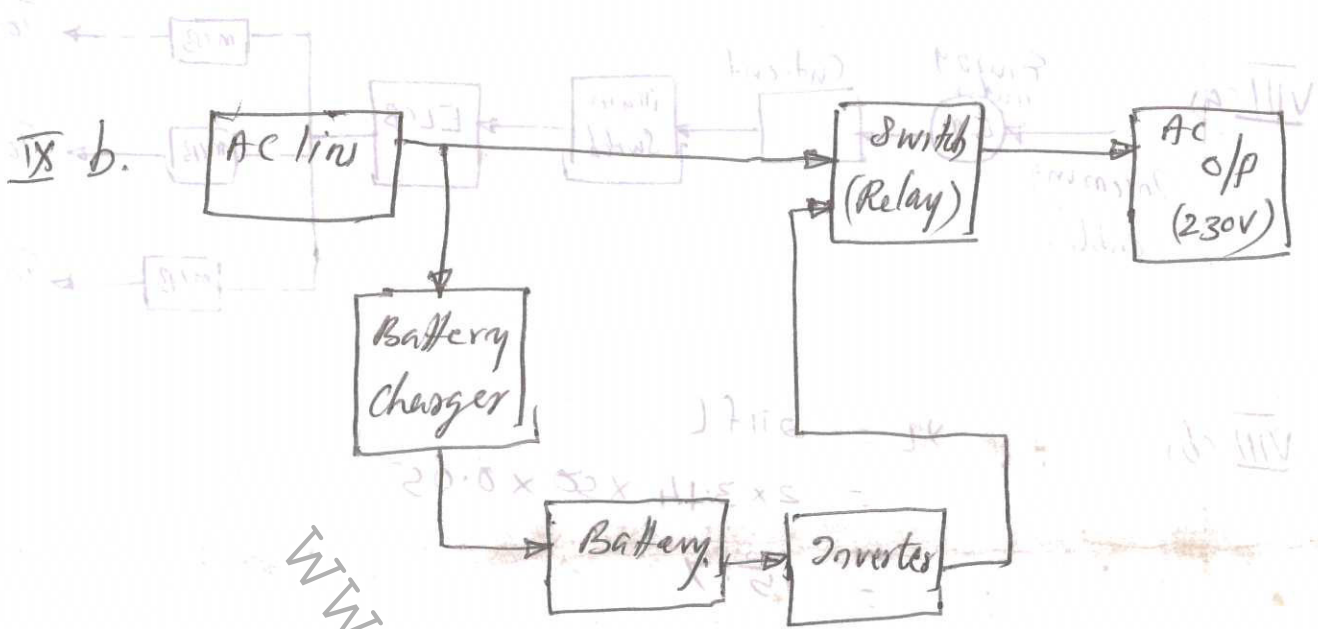
$$\begin{aligned}
 X_L &= 2\pi fL \\
 &= 2 \times 3.14 \times 50 \times 0.05 \\
 &= 15.7 \\
 Z &= \sqrt{R^2 + X_L^2} \\
 &= \sqrt{6^2 + 15.7^2} \\
 &= \sqrt{36 + 246.5} = \sqrt{282.5} \\
 &= 16.8 \text{ } \Omega \quad \text{--- (4 marks)} \\
 I &= \frac{V}{Z} = \frac{240}{16.8} = 14.285 \text{ A} \\
 \cos \phi &= \frac{R}{Z} = \frac{6}{16.8} = 0.357 \quad \text{(2 marks)} \\
 P &= VI \cos \phi = 240 \times 14.285 \times 0.357 \\
 &= 1224.4 \text{ W} \quad \text{(2 marks)}
 \end{aligned}$$

IX (a)

a. Improvement in capacity - CDMA gives better improvements in network capacity.

b. Better hand over / hand off

\* High level security \* multiple access, \* wide bandwidth \* spreading codes used.



IX (a) Light is produced by recombination of electrons with holes in an LED. So there is no burning gas or filaments inside a LED. Hence LED are more durable and produce only little heat. The small size makes them highly weather resistant. Single small LED is enough for a powerful torch. They need ~~only~~ only 50% energy used by CFL to produce the same light.

