Q No 1 (a)

Classification of overhead Transmission line.

A transmission line has three constant R, L and C distributed uniformly along the whole length of the line. the resistance and inductance form series impedance. the capacitance existing b/w conductor for 1-phase ~~linear~~ line or from a conductor to neutral for 3-phase line from a shunt path throughout the length of the line.

① Short Transmission lines:

when the length of an overhead transmission line upto about 50 km and the line voltage is comparatively low (< 20kV) it is usually considered a short transmission line.

(ii) Medium Transmission line:

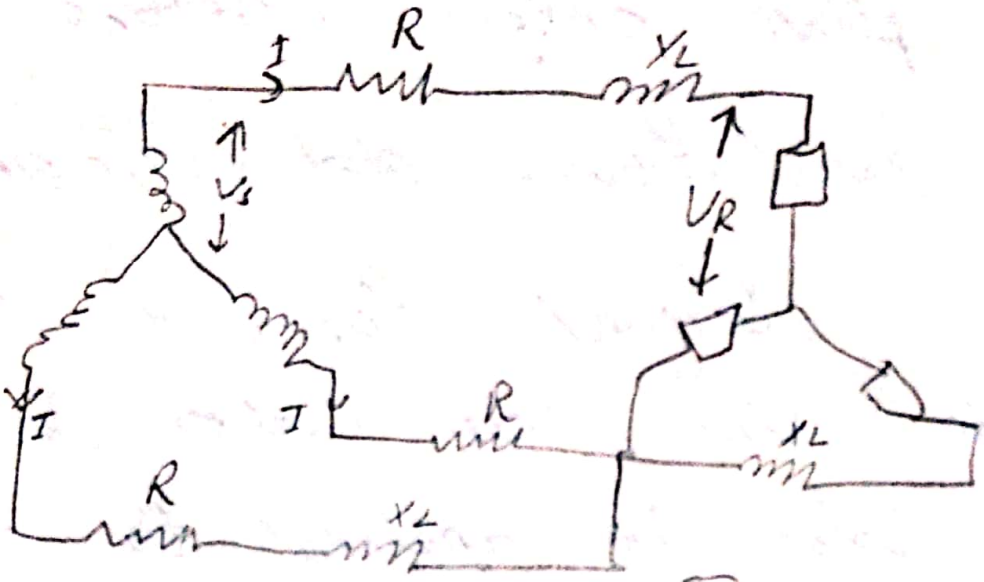
When the length of an overhead transmission line is about 50–150 km and the line voltage is moderately high (>20kV < 100 kV) it is considered as a medium transmision line. Due to sufficient length and voltage of the line, the capacitance effects are taken into account.

(iii) Long Transmission line:-

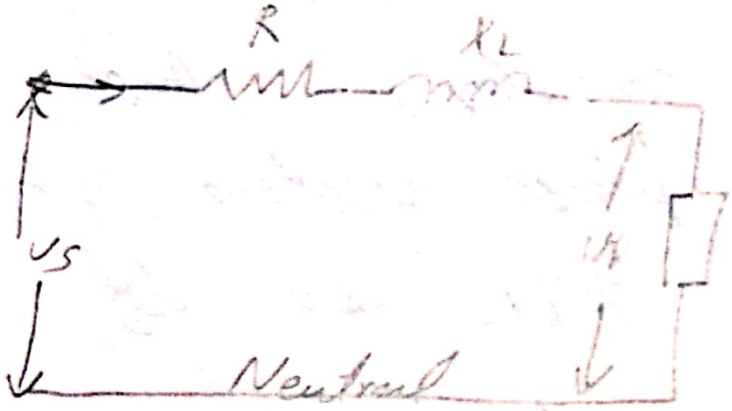
When the length of an overhead transmission line is more than 150 km and line voltage is very high (> 100 kV) it is considered as a long Transmision line

Q-1

(B)



(I)



(II)

This system may be regarded as consisting of three single phase unit, each wire transmitting one-third of the total power. as a matter of convenience, we generally analyze three phase system by considering

one phase only. Therefore expression for regulation, efficiency etc. derived for a single phase line can also be applied can also be applied to a three phase system. since only one phase is consider, phase value of three phase system should be taken. Thus V_S and V_R are the phase voltages where R and X_L are the resistance and inductive reactance per phase respectively.

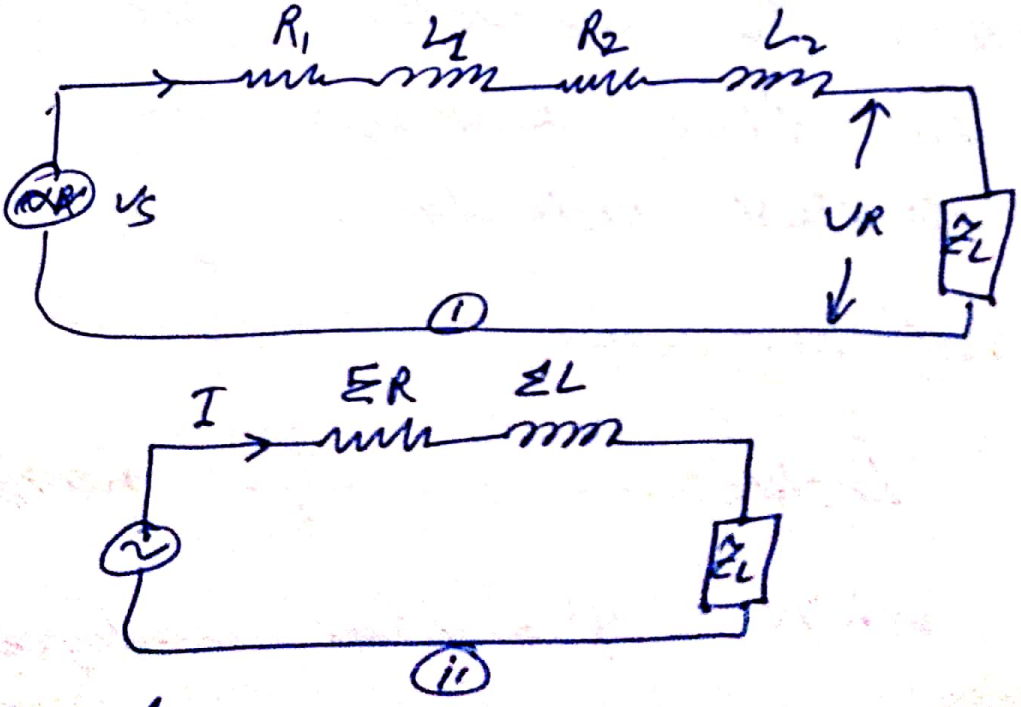
Fig (1) shows a Y-connected generator supplying a balanced Y-connected load through a transmission line.

Each conductor has a resistance of R Ω and Inductive reactance of X_L Ω. Fig (ii) shows one phase separately.

Q#2 (a)

Constants of a Transmission line.

A transmission line has resistance inductance and capacitance uniformly distributed along the whole length of the line. before we pass on to the methods of finding these constant for a transmission line it is profitable to understand them thoroughly



(i) **Resistance:-** It is the opposition of line conductors to current

flow. the resistance is distributed uniformly along the whole length of the line However the performance of a transmission line can be analyzed conveniatly if distributed resistance.

(ii) Inductance :-

when an alternating current flows through a conductor, a changing flux is set up which links the conductor. Due to these flux linkages the conductor passesses inductance.

Mathematically:-

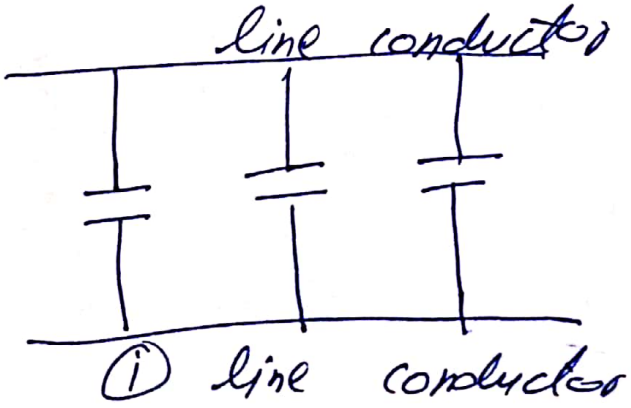
$$\text{Inductance } L = \frac{\Psi}{I} \text{ henry}$$

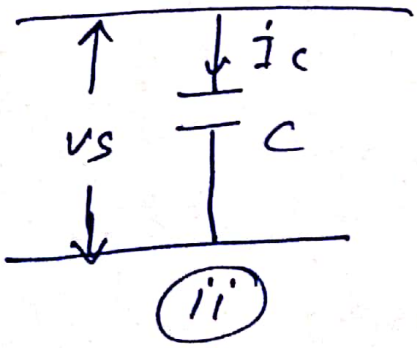
where Ψ = flux linkages in wiber

I = current in amperes.

(iii) Capacitance:-

We know that any two conductors seperated by an insulating material constitue a capacitor. As any two conductor of an overhead transmission line are seperated by air which acts as an insulation therefore capacitance exists b/w any two overhead line conductor.

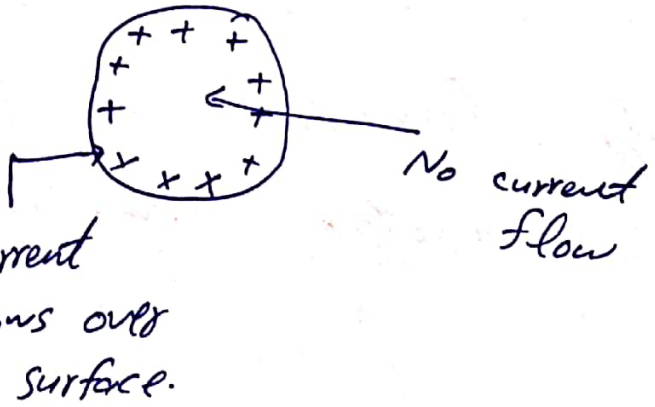




Q 2 (B)

Skin effect:->

When a conductor is carrying steady direct current (d.c) this current is uniformly distributed over the whole- x-section of the conductor. However on alternating current flowing through the conductor does not distribute uniformly, rather it has the tendency to concentrate near the surface of the conductor is this is known as skin effect.



the tendency of Alternating current to concentrate near the surface of a conductor is known as skin effect.

The skin effect depends upon the following factors.

(i) Nature of material

(ii) Diameter of wire - increases with the diameter of wire

(iii) Frequency - increases with the increase in frequency.

(iv) Shape of wire - less for stranded conductor than solid conductor.

It may be noted that skin effect is negligible when the supply frequency is low (< 50 Hz) and conductor diameter is small (< 1 cm).

Q 3 (A)

Line supports :-

* Woodan poles
* RCC poles
* Steel tabular poles
* Steel towers.

(*) Wooden poles :-

* Made of chemically treated wood.
* Used for distribution lines espacially in ~~areas~~ areas where good quality wood are avialable
* Very economical but capable to decay.

(*) RCC poles.

* Made of reinforced concrete cement.

* Stronger than wood poles but more costly.
* Very long life and needed little maintance.
* Bulky and heavy.
* Can be manufactured at site.

(4) Steel tubular poles:

stepped pole manufactured from a single tube. the diameter being reduced in parallel steps.

* More costly than RCC and wooden poles.
* Widely used for lines upto 33 KV.

Steel towers:-

- Used for lines of 66 kV and above.
- Very long life and high degree of reliability.
- Can withstand very severe weather conditions.
- overhead HV, EHV and UV lines mostly use self supporting steel towers.

Name : Sajid Ahmad
ID : 12671

BE (E)
ITD

(14)

Q3 (B) Types of Insulator:→

(i) Pin type insulator
(ii) Suspension type
(iii) Post type
(iv) Strain insulators.

(i) Pin type Insulator:-

(a) Small, simple in construction and cheap.
(b) Used on lines upto and including 33 kV.
(c) for heigher voltage they tend to be more heavy and costly.

Suspension type:-

(a) Used for lines above 33 kV.

* Also known as disc or string Insulators.
* Consists of porcelain discs mounted one above the other.
* the conductor is suspended below the point of support by an insulator string.

Post Insulators:-

Used for supporting bus bars and disconnecting switches in sub-stations.

* In extra high voltages sub station polycon post insulators.
* Similar to pin insulator but has a metal base and metal cap.

Strain Insulators:-

(i) Special mechanically strong suspension Insulators

(ii) Similar to suspension type Insulators

(iv) Used to take the tension of the conductor at the line termination and at portion where there is a change in direction of line.

the end