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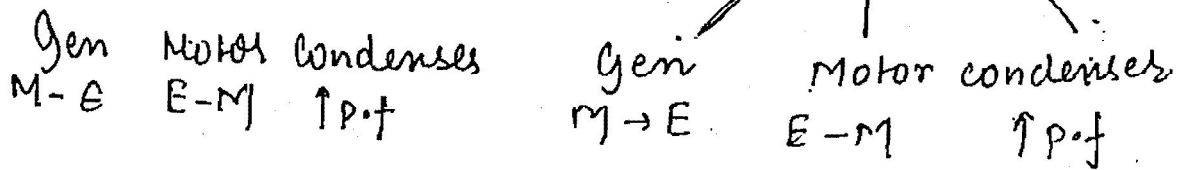
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SYNCHRONOUS MACHINES



- Commonly used generator in Power Plants universally, also called as alternator as it generates ac voltage which is stepped up to much higher value and transmitted through X-mls.
- They run at a standard speed called as synchronous speed for given freq and No of poles
- These are doubly excited type because rotor is excited by dc supply as well as additional mechanical i/p is given across the rotor
- Principle of operation is according to Faraday Law.
- If a commutator is dropped from a dc generator and if two slip rings are used to collect it is a generator if it is rotated at synchronous speed it can be called as synchronous generator but with rotating armature and stationary field structures.
- In dc generator winding (armature should rotate) for commutator's action. In alternators there is no such commutator therefore it is not necessary that the armature should be a rotating member; it can be either rotating or stationary.
- Small rating alternators < 5kVA only may have rotating armature but practically synchronous generators of large rating commonly contain

stationary armature rotating field structure.

Advantages of Stationary Armature:-

eg 500 MVA
11 kV

$$I = \frac{500 \times 10^6}{\sqrt{3} \times 11 \times 10^3} = 26243 \text{ A}$$

* Excit. Voltage is DC

125 - 500 V DC

1 MW power $I = \frac{1000000}{500} = 2000 \text{ A}$

1) Simple Design:- To collect large current from rotating part, becomes very complicated practically and expensive because (3+1) slip ring with HV insulation and high current carrying capacity.

2) Insulation is effective if armature is on stationary part. Stationary slots will offer better insulation as well as they offer more space.

3) Efficient Cooling: It is easy to provide air passage, cooling tubes, water/hydrogen cooling on a stationary part.

4) More O/P: As the rotor is lighter in weight supports high speeds so for a given size it gives more O/P with more speed.

5) Right Construction: As the winding is on stationary part it has more dynamic balance against electromagnetic stresses during S.C.

Due to more width of slot and teeth they are stronger.

- b) Leakage Reactance:- will be less because stator offers more width in the slots and contains more cu per slot. If it is on rotor depth will be high due to less space which produces more leakage reactance

CONSTRUCTION DETAILS:-

- Like all other rotating electric machines it contain stationary part Stator, Rotating part Rotor with an air gap.
- The stator basically contain core and windings, rotor contains poles and field winding.

STATOR:-

- It contains an outer frame made up of cast iron or steel only for mechanical protection of the entire m/c there is a stator core made up of sheet steel (Si steel lam 0.5mm thickness) to produce least core losses.
- The stator core is punched into slots which are generally open type in practical synchronous m/c they contain 3- ϕ winding.

