

Course title: Electrical Machines

Course code: EE329

Sheet #7

- 1- A three phase, 8 pole synchronous generator is star connected. The stator has 168 slots with 9 conductors per slot. If the rotor speed is 750 rpm, estimate the flux required in the air gap to generate an e.m.f. of 1000V between lines (Winding factor=0.96)
- 2- In a 50kVA, star connected, 440V, three-phase, 50Hz alternator. The armature resistance is 0.25Ω /phase. The armature reactance is 3.7Ω /phase. Determine at rated load and unity power factor the induced e.m.f. per phase and voltage regulation. Sketch phasor diagram.
- 3- A three phase alternator is rated at 5kW, 110V, 29A lagging power factor, 50Hz and 1000rpm. The stator resistance per phase is 0.1Ω and armature reactance is 1.53Ω . The field current was I_{fl} (Full load current).
 - a) Find the no load induced e.m.f. voltage regulation and number of poles.
 - b) If the field current is reduced to $(0.9I_{fl})$ while speed is kept constant, what would be the load voltage if the generator is supplying the load with the same load current at the same power factor.
 - c) If the speed, field current and load current are kept constant, the power factor is changed to 0.8 leading, what would be the terminal voltage.
- 4- A three-phase, star connected, 6 pole synchronous generator supplies a three-phase load of 100kW, 0.8 leading power factor at 60Hz, 2KV line voltage. The machine per phase armature resistance and reactance are 0.4Ω and 4Ω respectively. Find:
 - a) Voltage regulation
 - b) Maximum developed power
 - c) Efficiency, if constant losses are 10% of copper losses.