Arab Academy for Science and Technology

Electrical and Computer Control Department

Power System II (EE 441) sheet (4)

1- A 60Hz, four poles turbo generator is rated 50MVA, 22kV has an inertia constant of H=7.5 MJ/MVA. Find:

a- The kinetic energy stored in the rotor at synchronous speed

b- The angular acceleration if the electrical power developed is 400MW when the input less the rotational losses is 740000 hp.

2- If the acceleration computed for the generator described in problem 1 is constant for a period of 15 cycles, find the change in δ in electrical degrees in that period and the speed in revolutions per minute at the end of the 15 cycles. Assume that the generator is synchronized with a large system and has no accelerating torque before the 15 cycle period begins.

3- The generator of problem 1 is delivering rated megavoltamperes at 0.8 lagging power factor when a fault reduces the electric power output by 40%. Determine the accelerating torque in Newton meters at the time the fault occurs. Neglect losses and assume constant power input to the shaft.

4- A power system represented in figure 1 has reactances as marked on the single line diagram. The delivered power is 0.8 per unit when both the terminal voltage of the machine and the voltage of the infinite bus are 1 per unit. Determine the power angle equation for the system during the specified operating conditions.

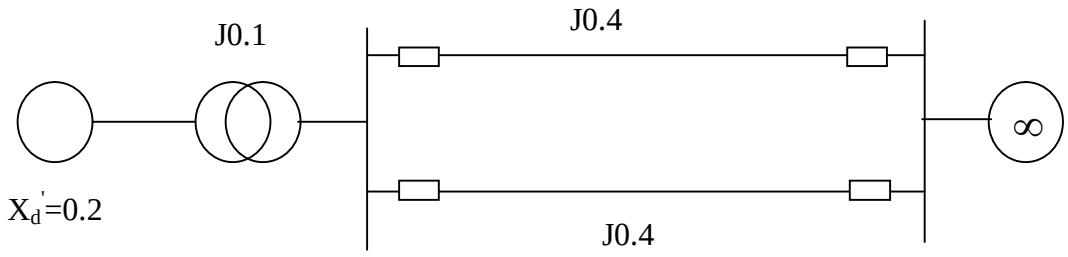

Figure 1

5- If a three phase fault occurs on the power system of problem 4 at a point on one of the transmission lines at a distance of 30% of the line length away from the sending end terminal of the line. Determine the power angle equation during the fault and the swing equation. Assume that the system is operating under the conditions specified in problem 4 when the fault occurs. Let H=5 MJ/MVA.

6- A generator having H= 6 MJ/MVA is delivering power of 1 per unit to an infinite bus through a purely reactive network when the occurrence of a fault reduced the generator output power to zero. The maximum power that could be delivered is 2.5 per unit. When the fault is cleared, the original network conditions again exist. Determine the critical clearing angle and the critical clearing time.

7- A 60Hz generator is supplying 60% of P_{max} to an infinite bus through a reactive network. A fault occurs which increases the reactance of the network between the generator internal voltage and the infinite bus by 400%. When the fault is cleared, the maximum power that can be delivered is 80% of the original maximum value. Determine the critical clearing angle for the condition described.