

Instructions: Any books / photocopied / printed materials are not allowed during the exam.
 However, ONE PAGE HAND WRITTEN notes are permitted.

1. For a short transmission line calculate the load power factor for which the zero voltage regulation is observed if R and L represents the line resistance and inductance? [2]
2. Explain Ferranti effect with the help of a phasor diagram. Using proper circuit diagram and phasor diagram show how compensation can help in avoiding this scenario. [3]
3. A manufacturing plant uses 100 kVA at 0.6 p.f. lag during normal operations. A synchronous motor is added to the system for power factor improvement. What is the resultant power factor of the plant if the power required by the motor is 10 kW and it is operating at 0.5 p.f. leading? What should be the power factor of the motor to make the plant power factor as 0.9 lagging? [3]
4. A 3-phase 50 Hz generator having synchronous, transient and subtransient reactance of 80%, 30% and 20% respectively is rated at 500 MVA, 20 kV. The generator supplies power to a resistive load (connected directly across the terminals of the generator) of 400 MW at 20 kV. If all the three phases of the generator are short circuited simultaneously; find the fault current in per-unit on a base equal to the machine ratings as well as its actual value in Amps. [3]
5. Two buses are connected through a line as shown Fig 1. Base data required to carry out load flow analysis are as below

Bus1: $|V_1|=1.05$ p.u,

Bus2: $|V_2|=1.1$ p.u, $P_{G2} = 100$ MW, $Q_{max} = 50$ MVar, $Q_{min} = -25$ MVar;

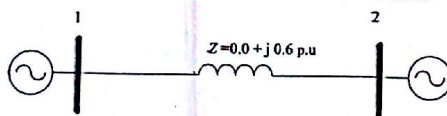


Fig.1

Taking a base of 100 MVA; calculate the power injections at the buses. [3]

If a fixed inductor of 25 MVar at 1.1 p.u. voltage is additionally placed at bus-2,

- a. Bus-2 will continue to be a PV bus. True/false. Justify? [0.5+1]
 - b. Voltage magnitude at the buses will be same as specified. True/false. Justify? [0.5+1]
6. The arrows shown in Fig.2 indicate the direction of Real power flow. Correlating logically Fig.2 and Table-1 identify at least three errors and justify them. [3]

Hint: Power flow directions and |V| are correct

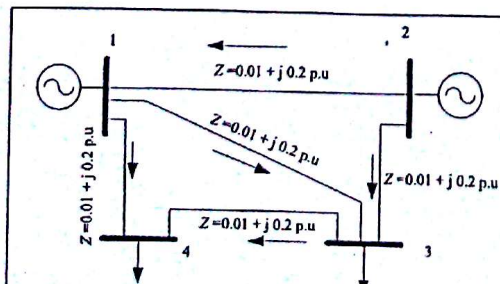


Fig. 2

| Bus no. | Angle | V | P _i | Q _i |
|---------|---------|--------|----------------|----------------|
| 1 | 0.0000 | 1.0000 | 1.6 | 0.7855 |
| 2 | -1.6949 | 1.0000 | 1.0 | 0.3064 |
| 3 | -8.5157 | 0.9441 | -1.2 | -2.00 |
| 4 | 13.0968 | 0.9172 | -1.4 | -3.00 |

Table-1