(3Hrs) **Marks: 80**

N.B.

1. **Question No.1 is Compulsory**.
2. Answer any three out of remaining five questions
3. Assume any suitable data wherever required but justified the same
4. Illustrate answer with sketches wherever required

Q 1 Answer **any four** from the following questions. **(20)**

a. Describe the significance of transposition of three phase overhead transmission lines.

b. Define per unit system. Calculate the per unit impedance, per unit current for 50Ω of three phase transmission line considering 100MVA, 220kV as base value.

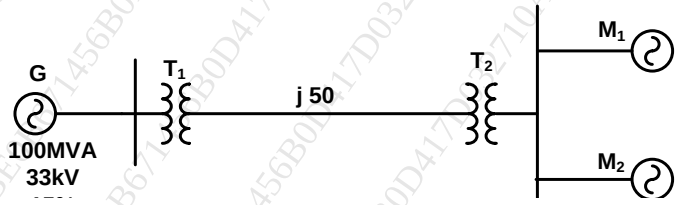
c. Derive the equation for inductance of three phase line equilateral spacing.

d. Illustrate the Ferranti effect.

e. Name the various components of Power cable. Illustrate the significance of Armoring in cable.

Q 2 a) A 3phase 132kV, 100km, 50Hz, single circuit line has horizontal spacing of 6m between adjacent conductors. The conductor diameter is 1.2cm. Find the capacitance/phase, Charging current/phase and charging MVA of **(10)**

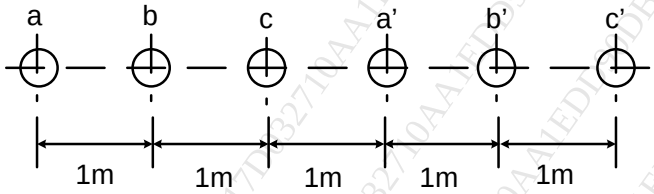
b) A 100 MVA, 33 kV 3-phase generator has a sub transient reactance of 15%. The generator is connected to the motors through a transmission line and transformers as shown in Fig. The motors have rated inputs of 30 MVA and 50 MVA at 30 kV with 20% sub transient reactance. The 3-phase transformers are rated at 110 MVA, 32 kV, Δ/110 kV Y with leakage reactance 8%. The line has a reactance of 50 ohms. Selecting the generator rating as the base quantities in the generator circuit, calculate the new p.u. value of the impedances and draw the impedance diagram of the network. **(10)**



Q 3 a) Derive expression for inductance of 3 phase line with unsymmetrical **(10)**

b) A 15 km long 3 phase overhead line delivers 5 MW at 11KV at a power factor of 0.8 lagging. Line loss is 12% of power delivered. Line inductance is 1.1mH/Km. Calculate ABCD parameters, sending end voltage, sending end current and sending end power. **(10)**

Q 4 a) A double circuit three phase line as shown in the Figure below. The conductors a, a', b, b' and c, c' belong to the same phase respectively. The radius of each conductor is 1.5cm. Find the inductance of the double circuit line in mH/phase/km. **(10)**



b) Derive the expression for Capacitance of single phase two wire line. **(10)**

Q 5 a) Derive the expression for flux linkages due to single current carrying conductor. **(10)**

b) Illustrate the term step potential and touch potential. **(05)**

c) What do you understand by grading of cables? Explained any one in detail. **(05)**

Q 6 a) Derive the expressions for A, B, C, D constant and draw phasor diagram for medium transmission line in nominal T method. **(10)**

b) Define Neutral grounding. Discuss the advantages of neutral grounding. Illustrate solid grounding in detail. **(10)**
