QP Code : **5307**

(3 Hours) [Total Marks : 80

N.B. : (1) Question no. **1** is **compulsory**
(2) Attempt **any three** questions from remaining questions.
(3) Assume suitable data if necessary.

1. (a) Explain transposition of power line 20
   (b) Give classification of tower based on angle of deviation.
   (c) Compare AC and DC supply System.
   (d) Why transmission systems are operated at high voltage.

2. (a) Derive an expression for inductance of 1 ϕ, 2 wire line with solid conductors. Write 10
   assumptions.
   (b) Derive an expression for capacitance per phase per km of a 1 ϕ line taking into 10
   account effect of ground.

3. (a) Prove that per unit impedance of transformer can be made same referred to both the 5
   windings by selecting proper voltage based on either side.
   (b) Fig. Shows a power systems. The ratings of generators and transformers are 15
   Generator 1 → 25 MVA, 6.6 kV, Xd = j 0. 2 pu
   Generator 2 → 20 MVA, 6.6 kV, Xd = j 0. 15 pu
   Generator 3 → 30 MVA, 13.2 kV, Xd = j 0. 15 pu
   Transformer 1 → 30 MVA, 6.6 /115 kV, X= j 0. 1pu
   Transformer 2 → 15 MVA, 6.6 /115 kV, X= j 0. 1 pu
   Transformer 3 → 3 Single phase units each rated at 10 MVA, 69/6.9 KV with
   X= j 0.1 pu.

   Draw per unit reactance diagram if line L1 and L 2 reactances are 120 Ω and 90 Ω
   respectively. Select base of 30 MVA, 6.6 kV in generator -1 circuit.

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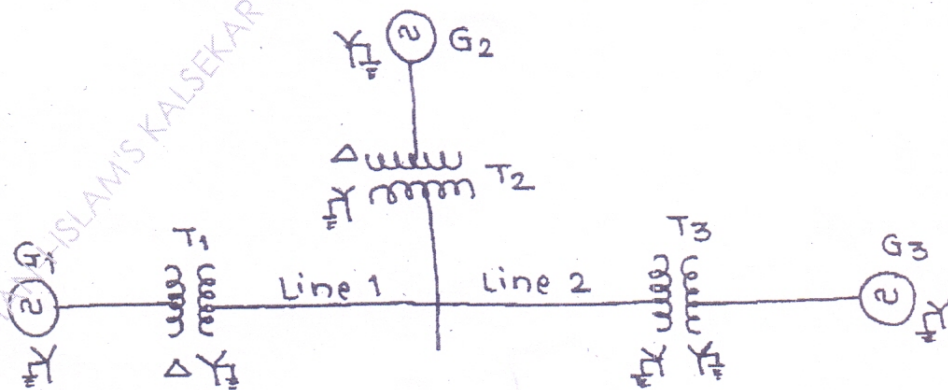
4. (a) The 3 ϕ double circuit line has configuration as shown in fig. The radius of each conductor is 0.9 cm. Find inductance/ ph/ km of line. **10**
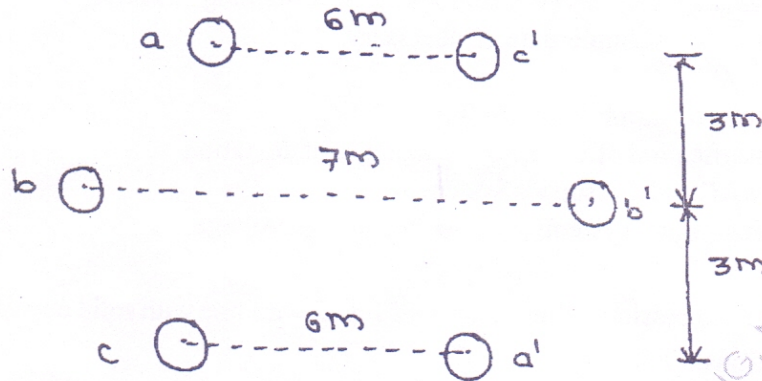
(b) What is string efficiency ? Derive expression for string efficiency. **10**

5. (a) What is insulation resistance of cable ? Derive expression for insulation resistance of single core cable. **10**

(b) An overhead line at a river crossing is supported from two towers at heights of 40 m and 90 m above water level. The horizontal distance between towers being 400 m. If maximum allowable tension is 2000 kg. Find clearance between conductor and water at a point midspan between two towers. Weight of conductor is 1 kg/m. **10**

6. Attempt any **two** :- **20**
   (a) Explain surge impedance and surge impedance loading.
   (b) What is grading of cable? Explain any one method.
   (c) What is tower footing resistance. Explain measurement of tower footing resistance.