[4658] – 67

Seat No.	

T.E. (Electrical) (Semester – II) Examination, 2014
POWER SYSTEMS – II
(2008 Course)

Time : 3 Hours | Max. Marks : 100

SECTION – I

1. a) Derive equation for active and reactive power flow in the transmission line and prove that reactive power flow in the transmission line proportional to voltage drop along the line. **8**

   b) A 3Φ 132 kV overhead line delivers 50 MVA at 132 kV and power factor 0.8 lagging at its receiving end. The constants of line are A = D = 0.98 $\angle 3°$ and B = 110 $\angle 75° \Omega$, C = 0.0005 $\angle 88°$. Find i) sending end voltage, current, PF and power angle ii) sending end active and reactive power. **8**

OR

2. a) Explain the procedure for drawing the receiving end circle diagram. What information can be obtained from power circle diagram ? **8**

   b) What is surge impedance loading ? Explain different methods used to improve surge impedance loading. **8**

3. a) Explain the advantages and disadvantages of EHVAC transmission. **8**

   b) How does corona occur ? What is the difference between visual critical voltage and disruptive critical voltage ? **8**

OR

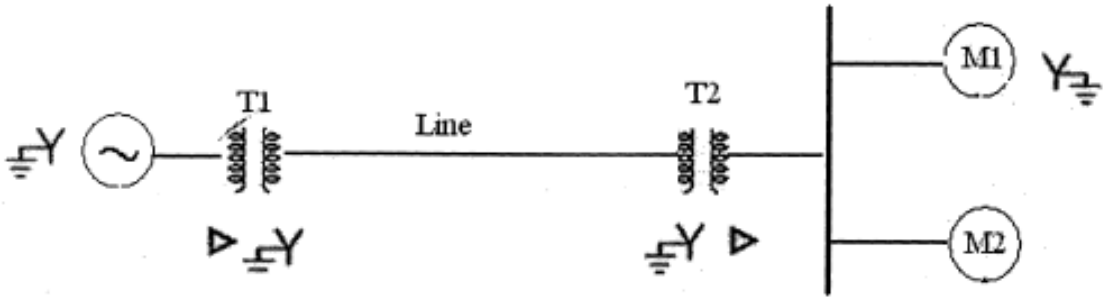
4. a) Estimate the corona loss for a three phase, 110 kV, 50 Hz, 150 km long transmission line consisting of three conductors each of 10 mm diameter and spaced 2.5 m apart in an equilateral triangle formation. The temperature of air is 30°C and the atmospheric pressure is 750 mm of mercury. Take the irregularity factor as 0.85. Ionization of air may be assumed to take place at a maximum voltage gradient of 30 kV/cm. **8**

   b) Explain power handling capacity and power loss at different voltage levels. **8**

P.T.O.

5. a) What is per unit system ? Explain the advantages and applications of per unit system. **9**

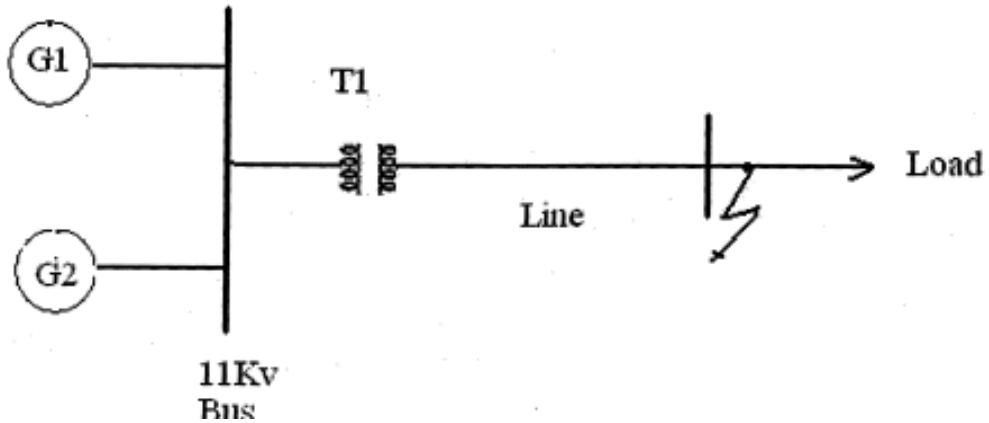
   b) A 50 MVA 15 kV three phase generator has a sub transient reactance of 0.20 pu. The generator supplies two motors over transmission line having transformers at both ends, as shown in the fig. The motors have rated inputs of 30 MVA and 20 MVA, both 30 kV with 0.15 pu sub transient reactance. The rating of the sending end transformer T_1 is 50 MVA 11 Δ -132 Y with leakage reactance of 0.10 pu. Transformer T_2 at the receiving end has three single phase transformers connected as three phase unit. The rating of each individual transformer is 20 MVA, 33/76 kV with leakage reactance of 0.12 pu. Series impedance of the line is (25 + j75 ohms). Draw the impedance diagram with all impedances marked in pu. Select the generator rating as the base in the generator circuit. **9**



OR

6. a) Explain the concept of sub transient, transient and steady state current and impedances of unloaded alternator under symmetrical fault condition. **9**

   b) A three phase transmission line operating at 33 kV and having a resistance and reactance of 5 Ω and 20 Ω respectively is connected to a generating station bus bar through a 15 MVA step up transformer which has a reactance of 0.08 pu. As shown in fig. Bus bar is connected to two generators one 10 MVA having 0.10 pu and another 5 MVA having 0.075 pu reactance. Calculate the short circuit MVA and the fault current when a three phase short circuit occurs at the load end of the transmission line. **9**



SECTION – II

7. a) Derive the expression for fault current when LLG fault occurs at the terminals of solidly grounded star connected alternator. **8**

   b) A 50 MVA, 11 kV, 3 phase synchronous generator was subjected to different types of faults. The fault currents are as follows :

   LG fault – 4500 amp

   LL fault – 3000 amp

   LLL fault – 2500 amp

   The generator neutral is solidly grounded. Find per unit values of 3 sequence reactance of generator. **8**

OR

8. a) Show that fault current $I_f = 3E/Z_1 + Z_2 + Z_0$ when L-G fault occurs at the terminals of solidly grounded star connected alternator. **8**

   b) A 3 phase, 37.5 MVA, 33 kV alternator having $X_1 = 0.18$ pu, $X_2 = 0.12$ pu and $X_0 = 0.1$ pu based on its rating is connected to a .33 kV overhead line having $X_1 = 6.3\ \Omega$/ph, $X_2 = 6.3\ \Omega$/ph and $X_0 = 12.6\ \Omega$/ph. A single line to ground fault occur at remote end of the line. The alternator neutral is solidly grounded. Calculate fault current. **8**

9. a) Derive static load flow equations for n bus system and give the classification of bus for load flow analysis. **10**

   b) Determine the Y bus for the three bus system. Neglect the shunt capacitances of the lines. The line series impedances are as follows. **6**

Bus Code	Impedance (pu)
1 – 2	0.08 + j 0.24
1 – 3	0.02 + j0.06
2 – 3	0.06 + j0.18

OR

10. a) Explain in brief the procedure for formulation of Y bus using singular transformation. **8**

    b) Compare Newton Raphson method with Gauss Seidal method of load flow analysis. **8**

11. a) Explain different types of HVDC links. Name any two HVDC systems in India. **10**

    b) Explain constant ignition control method for HVDC transmission system. **8**

OR

12. a) Give advantages and disadvantages of HVDC transmission system. **8**

    b) Explain components of HVDC transmission system with single line diagram. **10**

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