Total No. of Questions : 8]

SEAT No. :

P750

[Total No. of Pages : 3

[5870]-1054
T.E. (Electrical)
POWER SYSTEM - II
(2019 Pattern) (Semester - II) (303148)

Time : 3 Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right side indicate full marks.*
4) *Use of calculator is allowed.*
5) *Assume suitable data if necessary.*

Q1) a) Take base MVA=20MVA and base kV=6kV on motor load in figure 1 and draw per-unit impedance diagram to these base values. **[8]**

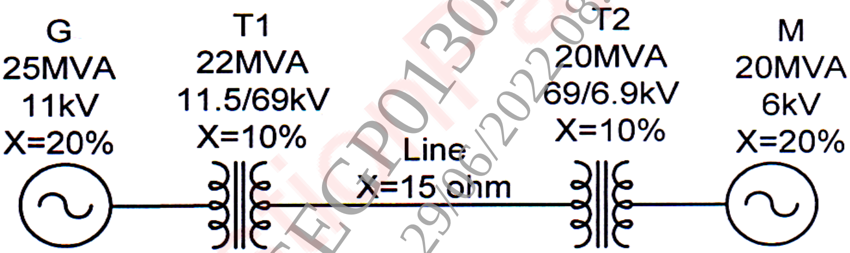

Figure 1

b) Justify the following statements. **[9]**

i) Y-bus is perferred instead of Z-bus in power system analysis.

ii) Per unit system is preferred over actual system parameters.

iii) The decoupled load flow method is faster than the Newton-Raphson load flow method.

OR

Q2) a) Determine the unknown elements from the following Y_{Bus} matrix. **[10]**

$$Y_{BUS} = \begin{bmatrix} ? & ? & ? & ? \\ -j2 & ? & -j5 & ? \\ -j4 & ? & ? & -j4 \\ 0 & -j7 & ? & ? \end{bmatrix}$$

b) Prove that per unit impedance of transformer on both sides are same. **[7]**

P.T.O.

Q3) a) What are the different types of current limiting reactor? With circuit diagram, elaborate operation of each type. **[9]**

b) Two 11kV, three phase 3MVA generators having sub-transient reactance of 15% operates in parallel.The generator is connected to a transmission line through a transformer of 6 MVA 11/22kV with leakage reactance of 5%. Choose the base MVA=6MVA and base kV = 11kV on the generator, convert circuit into per unit diagram. Determine fault MVA and fault current in kA, if the three-phase fault is on **[9]**

i) HT side

ii) LT side of transformer

OR

Q4) a) In case of three phase fault at the terminal of an unloaded alternator, prove that $x_d'' < x_d' < x_d$ and $I_f'' < I_f' < I_f$ with mathematical relation and diagram. (where I_f is fault current) **[9]**

b) The generating station at Koyna power plant is rated at 11kV with short circuit capacity of 1000MVA. The generating station at Radhanagar is also rated at 11kV with short circuit capacity of 670MVA. If these two generating stations are connected with interconnector of reactance $j0.4\Omega$, calculate possible short circuit MVA at each station. Take 1000MVA as base (Hint: Short circuit MVA=Base MVA/reactance in pu, Take base MVA=1000MVA and base kV=11kV). **[9]**

Q5) a) In case of LLG fault, show that fault current **[9]**

$$I_f = \frac{-3E_{a1}Z_2}{Z_1Z_2 + Z_2Z_0 + Z_0Z_1}$$

b) A three phase 100MVA synchronous generator with line to line voltage of 11kV is subjectd to a line to ground fault. The sequence reactance are $x_1 = j0.3pu$, $x_2 =$ j0.1pu and $x_0 = j0.05pu$. If the generator neutral is grounded through a reactance of $x_n = j0.05pu$, determine fault current and fault voltages. Also determine line currents and phase voltages of other phases if the fault is on phase a. **[9]**

OR

Q6) a) An unsmmetrical loaded transmision line is given in following figure 2. Show that $Z_0 = Z_s + 2Z_m + 3Z_n$ and $Z_1 = Z_2 = Z_s - Z_m$ **[9]**

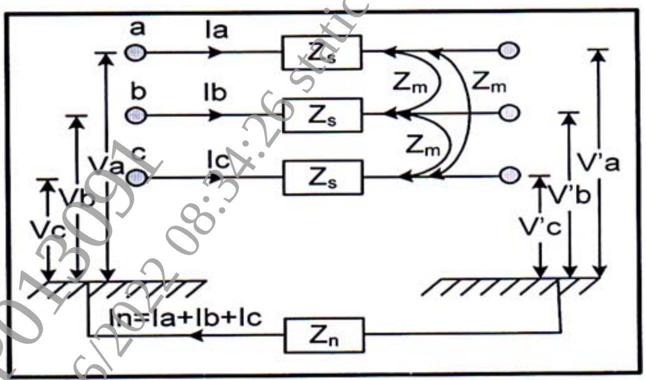

Figure 2

b) The potential difference to the neutral of a three phase, four wire systems are – 36V, j48V and 64V respectively. The currrents in corresponding line wires are (–1 + j2) Amp, (– 1 + j5) Amp and (– j3) Amp. Calculate negative sequence power. **[9]**

Q7) a) Compare HVDC and EHVAC transmisson system based on following points with due justification **[8]**

i) Insulation requirement

ii) Power transfer capability

iii) Conductor size

iv) Short circuit fault level

b) Draw the complete single line diagram of HVDC system showing all components and elaborate any three components in detail. **[9]**

OR

Q8) a) Write short note on : **[8]**

i) Homopolar HVDC link

ii) Back-to-Back HVDC link

b) Explain Constant current control in HVDC lines **[9]**

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