Total No. of Questions : 10]

SEAT No. :

P3515

[Total No. of Pages : 3

[5560]-165

T.E. (Electrical Engineering)

POWER SYSTEM - II

(2012 Course) (Semester - II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicates full marks.*
4) *Use of calculator is allowed.*
5) *Assume suitable data, if necessary.*

Q1) a) Explain why the conjugate of current is required to express complex power. **[5]**

b) What are different types of HVDC link? With neat diagram, elaborate one type in details. **[5]**

OR

Q2) a) Prove that long transmission line is a two port network possessing properties **[5]**

i) Symmetric

ii) Reciprocity

b) Compare HVDC and HVAC systems with respect to advantages and disadvantages. **[5]**

Q3) a) Derive power flow equation for receiving end side of transmission line. **[5]**

b) A three phase 220 kV, 50 Hz transmission line consists of 1.2 cm radius of conductor spaced 2 m at the corner of an equilateral triangle. Calculate disruptive critical voltage between the lines. Irregularity factor = 0.96, temperature = 20°C, barometric pressure = 72.2 cm of Hg. Dielectric strength of air = 21.1 kV(rms)/cm. **[5]**

OR

Q4) a) Define and write formula for **[5]**

i) Disruptive critical voltage

ii) Visual critical voltage

b) Describe the concepts line regulation and compensation. **[5]**

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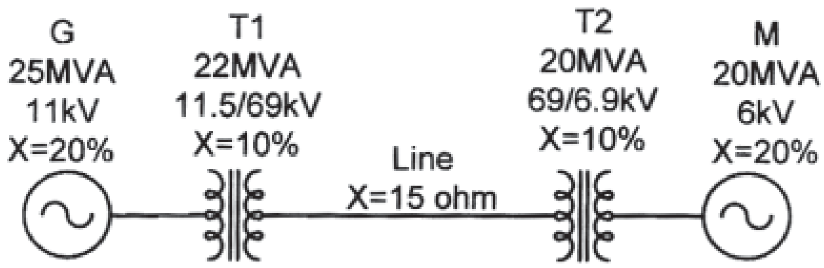
Q5) a) Take base MVA = 25MVA and base kV = 69 kV on transmission network and draw per unit diagram to these base values. **[8]**



b) Derive static load flow equation for n bus system. **[8]**

OR

Q6) a) Compare Newton Raphson method with Gauss Seidal method of load flow analysis. **[8]**

b) Determine the unknown elements from following Y_{Bus} matrix. **[8]**

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

Q7) a) A three phase 11kV, 5MVA, generator has a direct axis steady state reactance of 20%. It is connected to a 3MVA transformer having 5% leakage reactance and ratio of 11/33kV. The 33kV side is connected to a transmission line having 30 ohm reactance. A three phase fault occurs at other end of transmission line. Calculate steady state fault MVA and current supplied by generator assuming no load prior to the fault. Take base of 11kV, 5MVA on generator. **[8]**

b) 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) **[8]**

OR

Q8) a) What are the different types of current limiting reactor? With circuit diagram, elaborate operation of each type. **[8]**

b) A three phase 11kV, 10 MVA, generator has a direct axis steady state reactance of 10%. It is connected to a 5 MVA transformer having 5% leakage reactance and ratio of 11/33kV. The 33kV line side is connected to a transmission line having 1+j4 ohm impedance. A three phase fault occurs at other end of transmission line. Calculate steady state fault MVA and current assuming no load prior to the fault when fault is at **[8]**

i) Sending end of the line

ii) Receiving end of line. Take base of 11kV, 10MVA on generator.

Q9) a) In three phase transmission line, show that positive, negative and zero sequence impedence $Z_1 = Z_2 = Z_s - Z_m$ and $Z_0 = Z_s + 2Z_m$ **[9]**

where Z_s is self impedance and Z_m is mutual impedance of lines.

b) Draw zero sequence diagram for all types of combinations of transformer. **[9]**

OR

Q10) a) In case of LLG fault, show that fault current **[10]**

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

b) Prove that apparent power in three phase circuit is given by **[8]**

$$s_{abc} = 3V_{a0}I^*_{a0} + 3V_{a1}I^*_{a1} + 3V_{a2}I^*_{a2}$$

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