Total No. of Questions : 10]

SEAT No. :

P2947

[Total No. of Pages : 3

[5669]-536

T.E. (Electrical)

POWER SYSTEM - II

(2015 Pattern) (Semester - II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***All question compulsory.***
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) Prove that active power at receiving end is given by **[7]**

$$P_R = \frac{|V_S||V_R|}{|B|}\cos(\beta-\delta) - \frac{|A|}{|B|}|V_R|^2\cos(\beta-\alpha)$$

Where $\bar{V}_R = |V_R|<0$, $\bar{V}_S = |V_S|<\delta$, $\bar{A} = |A|<\alpha$ and $\bar{B} = |B|<\beta$

b) What are the factors affecting corona? **[3]**

OR

Q2) a) Prove that per unit impedance of transformer on primary and secondary side is same **[7]**

b) What is surge impedance loading? Elaborate its significance of surge impedance loading **[3]**

Q3 a) A power of 2000MW is required to be transmitted over a distance of 800km at voltage level of 400kV, 50Hz. The average values of line parameters are as given below: **[7]**

System voltage(kV)	400
r(Ω/phase/km)	0.031
x (Ω/phase/km)	0.327

Determine the following with 50% line compensation.

i) Possible number of circuits required with equal magnitude of sending and receiving end voltages with 30 degree phase difference.

ii) The current transmitted per phase

iii) Total line losses in percentage of power handling capacity.

P.T.O.

b) State the advantages of per unit system in power system analysis. **[3]**

OR

Q4) a) Show that receiving end complex power is a circle. Also derive radius and center formula. **[7]**

b) Increase in the spacing between the conductor, increases the corona loss in EHV AC transmission line. State true of false with justification. **[3]**

Q5) 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. **[9]**

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

OR

Q6) a) A 10 MVA, 6.6 kV, 3-phase star-connected alternator having a reactance of 20% is connected through a 5 MVA, 6.6 kV/33 kV transformer of 10% reactance to a transmission line having a resistance and reactance per conductor per kilometre of 0.2 Ω and 1 Ω respectively. Fifty kilometres along the line, a short-circuit occurs between the three conductors. Find the current fed to the fault by the alternator. Choose generator ratings are as base values. **[9]**

b) Draw waveform of fault current when unloaded alternator is shorted at its terminal. Also draw circuit and write formula of subtransient, transient and steady state reactance. **[8]**

Q7) a) A three phase 100MVA synchronous generator with line to line voltage of 11kV is subjected to a line to ground fault. The sequence reactance are x_1 = j0.3*pu*, x_2 = j0.1*pu* and x_0 = j0.05*pu*. If the generator neutral is grounded through a reactance of x_n = j0.05*pu*, determine fault current and fault voltages. Also determine line currents and phase voltages of other phases if the fault is on phase a. **[9]**

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

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

OR

Q8) a) Across a star connected symmetrical impedance load of 10Ω and a neutral impedance of (10/3)Ω, an unbalanced three phase supply with $V_a = 220\angle 0^o$ volts, $V_b = 200\angle -110^0$ volts and $V_c = 180\angle 110^0$ volts is applied. Determine the line currents using symmetrical components. **[9]**

b) Draw zero sequence network for following types of transformer connection **[8]**

i) Delta-star

ii) Delta-star with neutral solidly grounded

iii) Star-star with neutral grounded through impedance Zn

iv) Star with neutral solidly grounded -Delta

Q9) a) Draw the complete single line diagram of HVDC system showing all components and elaborate any three components in detail. **[8]**

b) Write short note on **[8]**

i) Development of HVDC lines in India

ii) Multi Terminal HVDC lines

OR

Q10)a) Explain constant current control in HVDC transmission system with characteristic and DC current equation. **[8]**

b) Compare HVDC and EHVAC transmission system based on following points with due justification **[8]**

i) Stability

ii) Power transfer capability

iii) Right of way

iv) Short circuit fault level

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