Total No. of Questions : 8]

SEAT No. :

PD4271

[Total No. of Pages : 3

[6403]-68
T.E. (Electrical)
POWER SYSTEM - II
(2019 Pattern) (Semester - VI) (303148)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.***
2) ***Use of calculator is allowed.***
3) ***Assume suitable data if necessary.***

Q1) a) Show that in transformer the per unit impedance of referred to primary and secondary is same. **[8]**

b) Determine the missing elements of the following Ybus matrix. **[8]**

$$Y_{BUS} = \begin{vmatrix} -j20 & j5 & j10 & ? \\ ? & -j25 & ? & ? \\ ? & j20 & ? & j10 \\ ? & ? & ? & ? \end{vmatrix}$$

OR

Q2) a) i) The transmission line impedance is 0.1 + j0.2 Ohm/km. If the length of line is 150km, what is the per unit impedance of the line on the base of 200MVA, 10kV?

ii) The impedance of a 200MVA, 10kV/200kV transformer referred to primary is (2 + j4) Ohm. What is the per unit impedance of the transformer referred to secondary?

iii) The per unit base on primary side of the transformer is 100MVA, 10kV. The rating of the transformer is 150MVA, 11kV/220kV. What is the base MVA and kV to be taken on secondary side of the transformer?

iv) A 100MVA, 11 kV alternator has reactance 10% on its own rating. What is the percentage reactance of alternator on 50MVA, 22kV base? **[8]**

b) Derive the generalize power flow equations for "n" bus power system. **[8]**

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Q3) Let all phases of an alternator is short circuited at its terminal: **[18]**

a) Draw the waveform of fault current showing sub transient, transient and steady state period. **[3]**

b) From above diagram comment on time period sub transient, transient and steady state period. **[3]**

c) Draw the reactance diagram and write its formula for sub transient, transient and steady state period. **[3]**

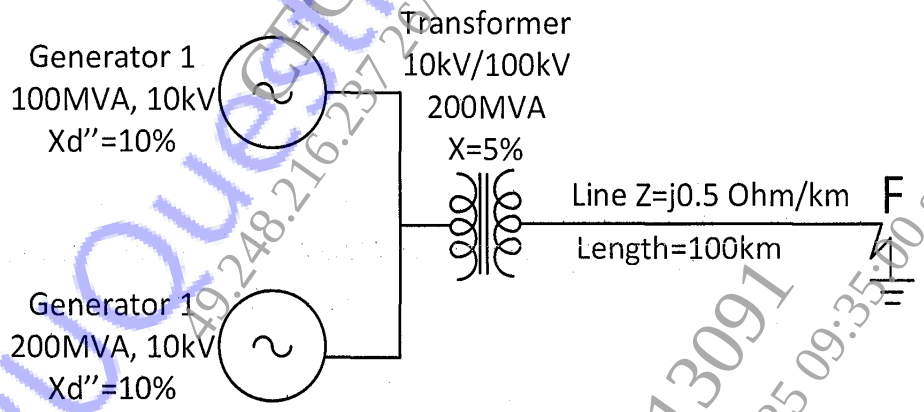
d) If the damper winding reactance is j0.1 pu, field winding reactance is j0.2 pu, armature reactance is j0.3 pu and leakage reactance is j0.5 pu. Calculate sub-transient, transient and steady state reactance. **[3]**

e) Justify that the fault current under sub transient period is more that transient and steady state period. **[3]**

OR

Q4) a) Show that when an alternator (or RL circuit) is shorted at its terminal derive the formula for maximum possible fault current to be supplied by the alternator? **[8]**

b) Determine the fault current and fault MVA when the three phase fault is occurred at point F in following: **[10]**



i) Draw per unit impedance diagram with generator 1 rating as a base. **[3]**

ii) Find the per unit impedance upto fault point. **[2]**

iii) Fault current in kA. **[3]**

iv) Fault current supplied by each generator in kA. **[2]**

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Q5) a) Derive the equation of fault current in case of LLG fault. **[9]**

b) In a three phase circuit the phase voltages and currents are given as **[9]**

$V_a = 100\angle 0^0$ V, $V_b = 100\angle -110^0$ V, $V_c = 100\angle 110^0$ V

$I_a = 10\angle -30^0$ A, $I_b = 10\angle -140^0$ A, $I_c = 11\angle 80^0$ A

Calculate :

i) Symmetrical component voltages of phase a

ii) Symmetrical component currents of phase a

iii) Complex power using symmetrical components

OR

Q6) a) Draw the zero sequence impedance diagram for following connections of transformer **[9]**

i) Delta-Star

ii) Star-Star secondary neutral with solid ground

iii) Delta-delta

b) A double line to ground fault is occurred at a star connected 100MVA, 11kV alternator terminal. The sequence impedance of the alternator are x_1 = j0.2 pu, x_2 = j0.1 pu and x_0 = j0.05 pu. Calculate. **[9]**

i) Fault current in kA if neutral is solidly grounded. **[4]**

ii) Fault current in kA if neutral is grounded with j0.2 reactance. **[5]**

Q7) a) Draw the single line diagram of a HVDC system showing all components with proper labels. Explain the working of any three components used in HVDC transmission. **[9]**

b) Write a short note on Monopolar and Bipolar HVDC transmission line. **[9]**

OR

Q8) Write short note on any three of the following in details : **[18]**

a) Constant Current control in HVDC

b) Constant Extinction Angle Control in HVDC

c) Multi terminal HVDC

d) HVDC line in Maharashtra

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