

Total No. of Questions : 8]

SEAT No. :

PE-2535

[Total No. of Pages : 3

[6583]-61

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) i) The load impedance is $(20+j30)$ Ohm. If the base power is 100MVA and voltage base 11kV. What is the per unit load impedance. [2]
- ii) The per unit impedance of a 100MVA, 220kV/132kV transformer is $(0.1 + j 0.2)$ Pu referred to primary. What is the per unit impedance referred to secondary? [2]
- iii) The per unit reactance of a 50MVA, 10kV alternator is 10%. What is the per unit reactance of the alternator on 100MVA, 20kV Base. [2]
- iv) A transmission has resistance and reactance of 0.1 Ohm/km and 0.5 Ohm/km respectively. The length of line is 100km. What is the per unit impedance of the line to the base of 100MVA, 20kV. [2]
- b) Give the details classification of buses with known and unknown variables. Also explain the significance of each type of bus. [8]

OR

- Q2) a) The parameters of four bus system is given in following table. Determine the Ybus matrix of the system. [8]

Bus (From-To)	Reactance (Z) pu	Shunt admittance (B) (pu)
1-2	$j0.5$	$j0.4$
2-3	$j0.1$	$j1$
3-4	$j0.2$	$j1.2$
1-3	$j0.25$	$j0.8$

P.T.O.

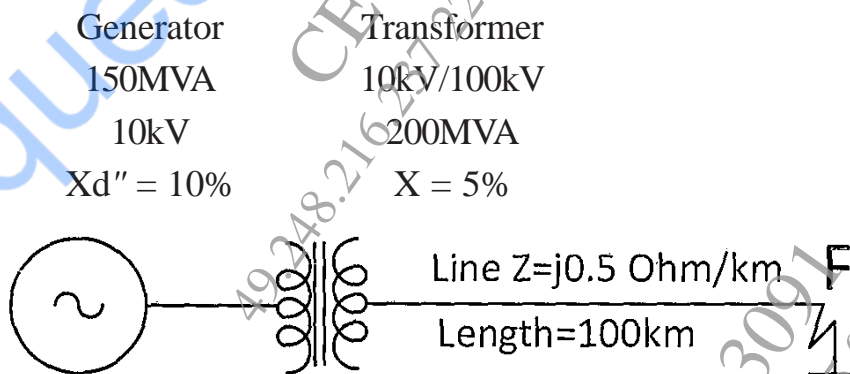
- b) What do you mean by per units system in power system? How the per unit values are calculated in power system? What are the advantages and disadvantages of per unit system? [8]

Q3) Let all phases of an alternator is short circuited at its terminal :

- Draw the waveform of fault current showing sub transient, transient and steady state period. [3]
- From above diagram comment on time period sub transient, transient and steady state period. [3]
- Draw the reactance diagram and write its formula for sub transient, transient and steady state period. [6]
- 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]
- Justify that the fault current under sub transient period is more that transient and steady state period. [3]

OR

- Q4) a) What is the use of current limiting reactor? What are its types based on location and based on construction? Explain any one type with diagram merits and de-merits. [8]
- b) In following system, the three phase fault is occurred at point F in following: [10]



- Draw per unit impedance diagram with generator rating as a base [3]
- Find the per unit impedance upto fault point [2]
- Fault MVA supplied by generator [1]
- Fault current in kA [2]
- Generator terminal voltage under fault. [2]

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

b) In a three phase circuit the phase voltages and currents are given as

$$V_a = 100\angle 0^\circ \text{ V}, V_b = 90\angle -120^\circ \text{ V}, V_c = 110\angle 120^\circ \text{ V}$$

$$I_a = 10\angle -30^\circ \text{ A}, I_b = 9\angle -150^\circ \text{ A}, I_c = 11\angle 90^\circ \text{ A}$$

Calculate :

i) Symmetrical component voltage of phase a [3]

ii) Symmetrical component current of phase a [3]

iii) Complex power using symmetrical components [3]

OR

Q6) a) Draw the zero sequence impedance diagram for following connections of transformer

i) Delta-Star [3]

ii) Delta-Star with solid ground [3]

iii) Delta-star with neutral impedance [3]

b) A single line to ground fault is occurred at a star connected 100MVA, 11kV alternator terminal. The sequence impedance of the alternator are $x_1 = j0.2 \text{ pu}$, $x_2 = j0.1 \text{ pu}$ and $x_0 = j0.05 \text{ pu}$. Calculate

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 following components. [9]

i) Smoothing reactor

ii) AC side HP filter

iii) Converter transformer

b) Explain the control characteristic of HVDC system with proper characteristic diagram. [9]

OR

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

a) Monopolar HVDC

b) Back to back HVDC

c) Multi terminal HVDC

d) HVDC line in Maharashtra

