B.E. Seventh Semester (Electrical Engineering (Electronics & Power)) (C.B.S.)

Electrical Power System - II

P. Pages : 3 **NKT/KS/17/7460**

Time : Three Hours * 0 1 0 6 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) Show that the positive and negative sequence impedances of transmission lines are same whereas its zero sequence impedance is higher than positive sequence impedance. **7**

b) The resolutions of a set three phase unbalanced voltages into symmetrical components gives the following results **7**

$V_{a1} = 425 \angle 0^{o}$ v $\quad V_{a2} = 210 \angle 35^{o}$ v

$V_{a0} = 30 \angle -30^{o}$ v

& components of currents are

$I_{a1} = 6 \angle -20^{o}$ A $\quad I_{a2} = 6 \angle 60^{o}$ A

$I_{a0} = 15 \angle 185^{o}$ A

Determine the complex power represented by these voltages and currents by

1) Symmetrical components

2) Unbalanced phase components.

OR

2. a) What do you understand by symmetrical components? What is their use. **7**

b) Explain the phase shift in positive and negative sequence voltage and current in a star/delta transformer by drawing phasor diagram. **7**

3. a) What is the need of reactors in power system? Explain the reactors as per their location in the power system. **6**

b) Three 6.6 KV generators A·B and C, each of 10% leakage reactance and MVA ratings 40,50 and 25 respectively are interconnected electrically as shown in fig.3(b) by a tie bar through current limiting reactors each of 12% reactance based upon the rating of the machine to which it is connected. A three phase feeder is supplied from the bus bar of generator A at a line voltage 6.6 KV. The feeder has a resistance of 0.06 Ω/phase and an inductive reactance of 0.12 Ω /phase. Estimate the maximum MVA that can be Fed into a symmetrical shoot circuit at the for end of the feeder. **7**

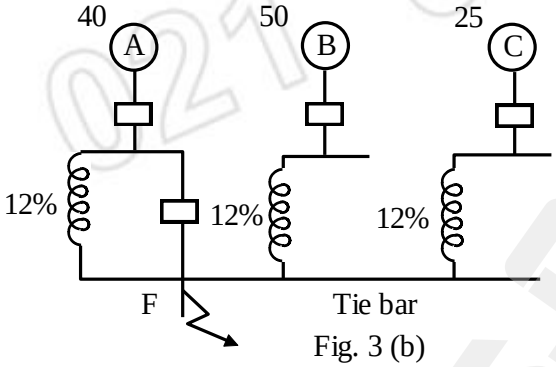
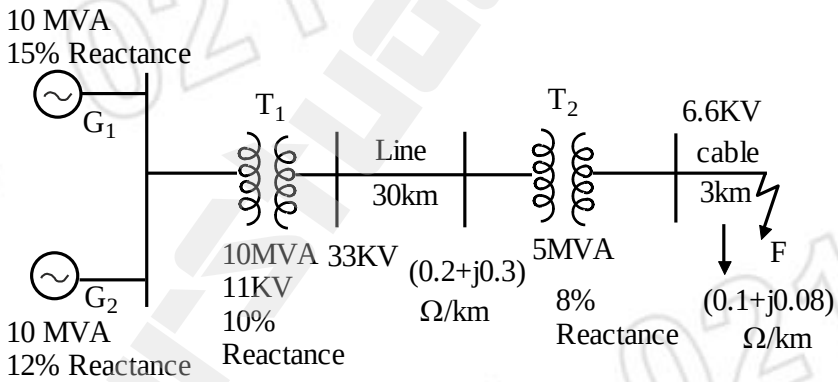


Fig. 3 (b)

OR

4. a) State the assumptions for symmetrical short circuit analysis. Derive the expressions for symmetrical short circuit current when a sudden short circuit occurs at terminals of transmission line with supply voltage Vm sin $(\omega t + \alpha)$. **7**

b) For the network shown a 3 phase fault occurs at F. Determine the fault current. **6**



5. a) Derive an expression for fault current for L-L fault with fault impedance Z_f by symmetrical component method. Draw sequence network. **6**

b) A 3 phase 10 MVA, 11KV generator with solidly earthed neutral point supplies a feeder. The relevant impedances of the generator and feeder in pu are as under. **7**

	Generator	Feeder
+ ve sequence impedance	j1.2	j1.0
-ve sequence impedance	j0.9	j1.0
zero sequence impedance	j0.4	j3.0

If a fault from one phase to earth occurs on the fqr end of the feeder. Calculate.

i) The magnitude of fault current.

ii) Line to neutral voltage at the generator terminals.

OR

6. a) Justify the statement "L-G fault may be more severe than 3 phase fault". **6**

b) Determine the fault current in each phase following a double line to ground S. C. at the terminals of a star connected synchronous generator operating on an open circuit voltage of 1.0 P.U. The star point of generator is isolated from the ground. **7**
The generator reactance are $x_1 = 0.35pu$ $x_2 = 0.25pu$ $x_0 = 0.2pu$.

7. a) State and deduce the relationship between two inertia constant G and H. **6**

b) Explain the concept of equal area criterion. How it can be used to study transient stability? **7**

OR

8. a) State and explain the assumption used for transient stability analysis. **7**

b) A generator operating at 50Hz delivers 1pu power to an infinite bus through a transmission circuit in which resistance is ignored. A fault takes place reducing the maximum power transferable to 0.5 pu where as before the fault this power was 2.0 pu and after the clearance of the fault if is 1.5 pu. By the use of equal area criterion, determine the critical clearing angle. **6**

9. a) Derive the co-ordination equation for economic load scheduling of power plant including transmission losses. Give the algorithm for solution of co-ordination equation. **7**

b) A power system has two generating plants and power is being dispatched economically with **7**
$P_1 = 130\,mw$ and $P_2 = 200\,mw$
Loss coefficient are
$B_{11} = 0.1 \times 10^{-2}\,mw^{-1}$
$B_{12} = 0.13 \times 10^{-2}\,mw^{-1}$
$B_{12} = 0.01 \times 10^{-2}\,mw^{-1}$
To raise the total load on the system by 1mw the additional cost is Rs 5/hour
find.
i) Total losses in the system ii) Penalty factor of plant 1.
iii) Additional cost/hour to increase the o/p of plant 1 by 1nw.

OR

10. a) The Fuel cost of two units are **8**
$C_1 = 1.5 + 20P_1 + 0.1P_1^2$ Rs/hr
$C_2 = 1.9 + 30P_2 + 0.1P_2^2$ Rs/hr
If the total load is 200 mw. Find the economic load scheduling of two units.

b) Write short notes on: **6**
i) General transmission loss formula. ii) Incremental fuel cost.

11. a) What are the various methods of neutral grounding. **6**

b) Explain the different types of compensating derives. **7**

OR

12. a) Derive the expression for reactance of peterson coil in terms of capacitance of the protected line & Determine inductance & KVA rating of arc suppression coil suitable for 33KV, 3 phase, 50Hz overhead line of 50km length has a capacitance to earth of each line is $0.01\mu f / km$. **7**

b) Write a short note on : **6**
i) Zig-zag transformer. ii) Problem of sub synchronous resonance.

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