B.E.-Electrical Engineering (E. & P.) Sem VI

EE604 - Electrical Power System-II

P. Pages : 3 **GUG/S/18/5364**

Time : Three Hours * 1 4 2 1 * Max. Marks : 80

Notes : 1. All questions carry equal marks.
2. Answer **five** questions as per option mentioned.
3. Due credit will be given to neatness and adequate dimensions.
4. Assume suitable data wherever necessary.
5. Illustrate your answers wherever necessary with the help of neat sketches.
6. Use of non-programmable calculator is permitted.

1. a) Show that the positive and negative sequence impedance of transmission lines are same where as its zero sequence impedance is higher than positive sequence impedance. **8**

b) A delta connected balanced resistive load is connected across an unbalanced three phase supply as shown in fig. 1 (b) with currents in lines A and B specified, find the symmetrical components of line currents. Also find the symmetrical components of delta currents. **8**

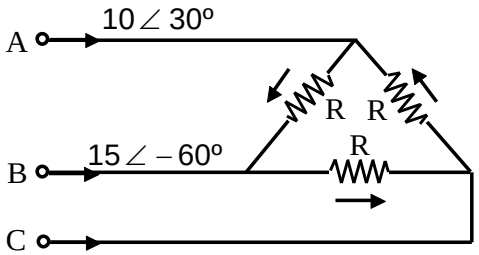


Fig. 1 (b)

OR

2. a) A 25 MVA, 11kV, 3 phase generator has a subtransient reactance of 20%. The generator supplies two motors over a transmission line with transformer at both the ends as shown in fig. 2(a). The motor have rated input of 15 and 7.5 MVA both 10kV with 25% subtransient reactance. The 3 phase transformer both rated 30MVA, 10.8 / 121 kV, with leakage reactance of 10% each. The series reactance of line is 100 ohms. Draw the positive and negative network of system, with reactances marked in per unit. **8**

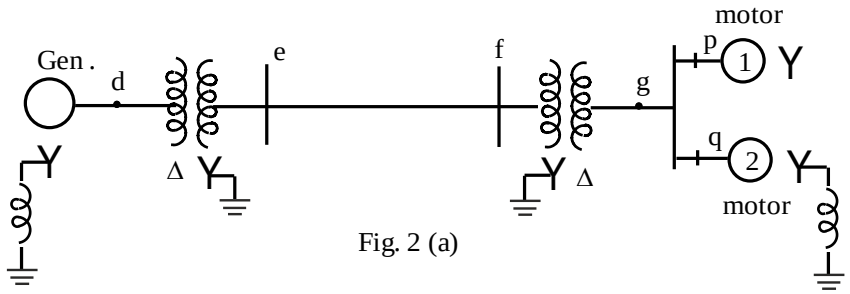
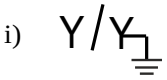
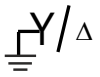
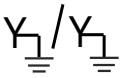


Fig. 2 (a)

b) Draw and explain the zero sequence networks for the following types of transformer connections: **8**

i) 

ii) 

iii) 

3. a) Derive an expression for symmetrical short circuit current when sudden short circuit occurs at the terminal of transmission line supplied by voltage source $V_m \sin(wt + \alpha)$. State assumptions made if any. **8**

b) For the radial network shown in fig. 3 (b), a three phase fault occurs at F. Determine the fault current and the line voltage at 11 kV bus under fault conditions. **8**

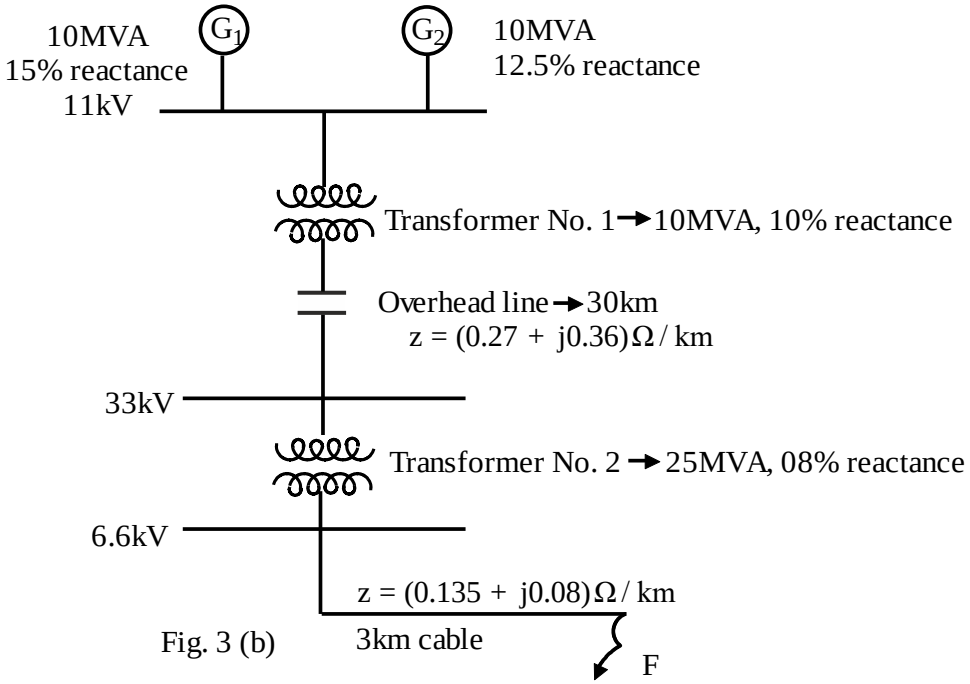


Fig. 3 (b)

OR

4. a) Derive the relationship to determine the interconnection of sequence network for L-G fault. **8**

b) A three phase transmission line operating at 11kV has an impedance $(1{\cdot}5 + j2{\cdot}0)\ \Omega$ per conductor and is connected through a 5000 kVA transformer of 5% reactance to 6.6 kV bus bar of generating station. Two generators are connected to bus bar each having capacity of 10,000 kVA at 15% reactance. **8**
Calculate short circuit current, if symmetrical fault occurs at
i) HT of transformer. ii) Far end of transmission line.

5. a) Derive for a synchronous machine **5**

$$M = \frac{GH}{180f}$$

b) Define the following terms: **6**
i) Steady state stability. ii) Dynamic stability iii) Transient stability

c) What is swing curve? How it is used in stability studies. **5**

OR

6. a) Explain equal area criterion of stability applied to a machine connected to infinite bus when sudden loss of one of parallel lines. **6**

b) A 50 Hz, 500 MVA, 400 kV generator (with transformer) is connected to a 400 kV infinite bus bar through an inter connector. The generator has H = 2.5 MJ/MVA, voltage behind transient reactance of 450kV and is loaded 460MW. The transfer reactances between generator and bus bar under various conditions are: **10**

Prefault 0.5 PU
During fault 1.0 PU
Post fault 0.75 PU

Calculate the swing curve using intervals of 0.05 sec and assuming that the fault is cleared at 0.15 second.

7. a) Explain the following terms related with economic operation of power system. **7**

i) Input – output curves
ii) Penalty factor
iii) Incremental fuel cost

b) The fuel input per hour of plant 1 and 2 are given as **9**

$f_1 = 0.2P_1^2 + 40P_1 + 120$ Rs per hr

$f_2 = 0.25P_2^2 + 30P_2 + 150$ Rs per hr

Determine the economic operation schedule and the corresponding cost of generation if the maximum and minimum loading on each unit is 100 MW and 25MW, the demand is 180 MW and transmission losses are neglected. If the load is equally shared by both the units, determine the saving obtained by loading the units as per equal incremental production cost.

OR

8. a) Derive the coordination equation for economic load scheduling between the plants with transmission loss considered. **8**

b) Draw and explain the block diagram for automatic load dispatch centre. **8**

9. a) Define the following terms: **8**

i) Neutral earthing or grounding.
ii) Reactance earthing
iii) Resistance earthing.
iv) Solid earthing or effective earthing.
v) Coefficient of earthing
vi) Resonant earthing

b) What is arcing ground ? Discuss any two method to avoid the arcing ground. **8**

OR

10. a) Explain the resonance grounding system and how the earth fault current is completely suppressed? **6**

b) A 132 kV, 50Hz, three phase, 100 km long transmission line has a capacitance of 0.012 microfarad per km per phase. Determine MVA rating of the arc suppression coil suitable for the line to eliminate arcing ground phenomenon. **4**

c) Explain the necessity of compensation. **6**

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