B.E. Electrical (Electronics & Power) Engineering Sixth Semester

EP604 - Electrical Power System – II

P. Pages : 2 **GUG/W/18/1685**

Time : Three Hours * 1 3 2 4 * Max. Marks : 80

Notes :
1. All questions carry equal marks.
2. Answer **five** questions as per internal choice.
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, Drawing instruments is permitted.

1. a) Discuss the principle of symmetrical Components. How will you convert a phase quantity into symmetrical components and vice versa. **8**

b) In a three phase system the symmetrical components of voltage of phase A are as follows **8**
$E_0 = 99\angle 264^o$, $E_1 = 87\angle 44^o$, $E_2 = 140\angle 284^o$
Calculate the 3 phase voltages E_A, E_B & E_C.

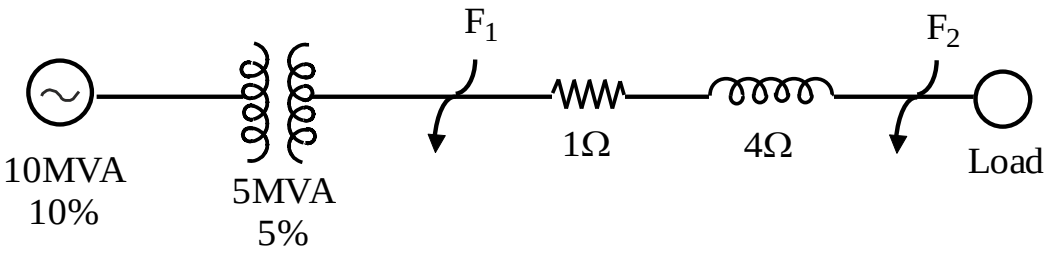
OR

2. a) Draw and explain positive, negative and new sequence network of synchronous machine. **8**

b) The three phase currents in star connected unbalanced load are **8**
$I_a = (44 - J33)$ Amps, $I_b = (-32 - J24)$ Amp, $I_c = (-40 + J25)$ Amps
Find the value of sequence currents.

3. a) Explain the various types of current limiting reacting with their advantages disadvantages. **8**

b) A 3 phase transmission line operating at 10 kV and having a resistance of 1Ω and reactance of 4Ω is connected to the generating station bus bars through 5 MVA step up transformer having a reactance of 5%. The bus bars are supplied by a 10 MVA alternator 10% reactance, Calculate the short circuit KVA fed to symmetrical fault between phases it occurs. **8**
1) at the load end of the transmission line.
2) at the high voltage terminals of the transformer.

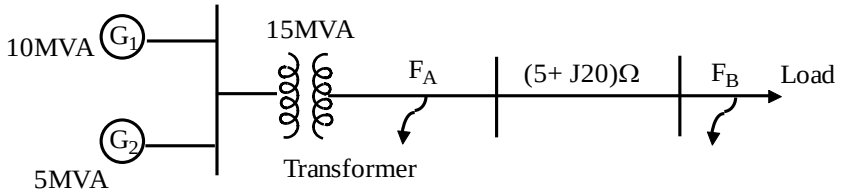


OR

4. a) Derive an expression for L – L fault current with fault impedance Z_f, by symmetrical component method. Also draw the sequence network. **8**

b) A 3 phase transmission line operating at 33 kV and having a resistance and reactance of 50Ω and 20Ω respectively is connected to a generating station bus bar through a 15 MVA step up T/f which has a reactance of 0.06 pu connected to the bus bar are two generates, one 10 MVA having 0.10 pu reactance and another 5 MVA having 0.075 pu reactance. Calculate the short circuit MVA and fault current when a 3 phase short circuit occurs at : **8**

1) The high voltage terminals of the transformer.
2) Load end of the transmission line.



5. a) A 50 Hz synchronous generator is connected to an infinite bus through a line. The p.u. reactances of the generator and line are J 0.3 pu and J 0.2 p.u. respectively. The generator no load voltage is 1.1 pu and that of infinite bus is 1.0 pu. The inertia constant of the generator is $3mw-sec/MVA$ determine the frequency of natural oscillations if the generator is loaded to i) 60% and ii) 75% of its maximum power transfer capacity and small perturbation in power is given. **8**

b) Derive swing equation and discuss its application in the study of power system stability. **8**

OR

6. a) Discuss the application of equal area criterion when a sudden increase in load takes place. **8**

b) Differentiate between steady state and transient stability of a power system. Discuss the factor that affects 1) Steady state stability 2) transient state stability of the system. **8**

7. a) The incremental fuel costs is Rs. Per mega watt hour for two units in a plant are given by **8**

$$\frac{dF_1}{dP_1} = 0.1P_1 + 20$$

$$\frac{dF_2}{dP_2} = 0.12P_2 + 16$$

The minimum and maximum loads on each unit are to be 20 mw and 125 mw respectively. Determine the incremental fuel cost and the allocation of load between units for the minimum cost when the loads are 1) 100 mw 2) 150 mw. Assume both the units are operating.

b) Discuss the following terms : **8**

1) Unit Commitment Problem.
2) Load Scheduling Problem.

OR

8. a) Derive the expression for optimum scheduling generation between two plants with transmission losses. **8**

b) Derive the expression for loss coefficients. **8**

9. a) Discuss the advantages of i) grounding the neutral of the system ii) keeping the neutral isolated. **8**

b) Explain the phenomenon of sub synchronous resonance problem and discuss the counter measures of it. **8**

OR

10. a) Explain the method of raising ground and suggest the method to minimize the effect of this phenomenon. **8**

b) Explain with a neat sketch shunt reactor compensation method of a very long transmission line with intermediate switching station. **8**

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