

POWER SYSTEM ANALYSIS AND PROTECTION

Paper-EE-306 N

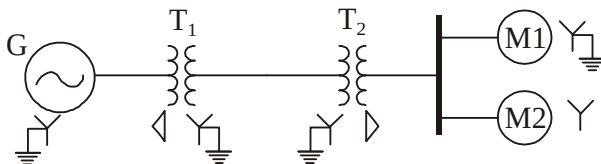
Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *five* questions in all, taking at-least *one* question from each unit.

UNIT-I

1. (a) Explain the performance of synchronous machines under steady state conditions by applying the per unit equations. 7
- (b) A 300 MVA, 20 kV three phase generator has a sub-transient reactance of 20%. The generator supplies two synchronous motors over a 64 km transmission line having transformers at both ends as shown on the single line diagram below. The ratings of the motors are: M1-200 MVA, 13.2 kV, $X'' = 20\%$; M2 = 100 MYA, 13.2 kV, $X'' = 20\%$. The ratings of transformers are T_1 -350 MVA, 230/20 kV, $X = 10\%$; T_2 -composed of 3 single phase transformers each rated 127/ 13.2 kV, 100 MVA, $X = 10\%$. Series, reactance of the transmission line is 0.5 ohm/km. Draw the reactance diagram with all reactances marked in p.u. Select the generator ratings as base values.



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2. (a) Draw and explain the zero sequence networks of star-delta and delta-delta transformers. 8
- (b) Explain the advantages of neutral grounding in a power system with the help of a neat schematic. 7

UNIT-II

3. Explain in detail (i) interruption of capacitive currents (ii) interruption of inductive currents with the help of suitable examples. 15
4. Explain in detail about rating of circuit breakers with the help of suitable illustrations. 15

UNIT-III

5. (a) A 3-phase, 11 kV, 25000 kVA alternator with $X_0 = 0.05$ p.u., $X_2 = 0.15$ p.u. and $X_2 = 0.15$ p.u. is grounded through a reactance of 0.3 ohms. Calculate the line current for a single line-to-ground fault. 6
- (b) Explain sequence network used for unsymmetrical short fault calculations in power systems with the help of suitable example. 9
6. Write a short note with respect to symmetrical faults in a power system on
- (a) Current limiting reactor.
- (b) Line to line fault. 15

UNIT-IV

7. (a) Enumerate and explain features of a good protective system. 6
- (b) Describe in detail construction, working, advantages and disadvantages of a differential relay. 9
8. Explain in detail protection of alternators in a power system against various types of faults with the help of suitable examples. 15
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