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Name.....

Reg. No.....

SEVENTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, NOVEMBER 2013

Electrical and Electronics Engineering

EE 09 701—POWER SYSTEM ANALYSIS

Time : Three Hours

Maximum : 70 Marks

Part A

Answer **all** *questions.*

1. Give the advantages of per unit system.
2. What is the necessity of load flow studies in power system ?
3. Define the hard type and soft type power system constraints.
4. What is meant by doubling effect ?
5. Define critical clearing angle.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. Compare the G–S and N–R methods of load flow solutions.
7. Explain the following terms related with a thermal power station :
   (a) Heat rate.
   (b) Incremental production cost.
   (c) Incremental efficiency.
8. Briefly explain the speed governing mechanism of turbo generator.
9. Write a short note on zero sequence impedance of transformer.
10. A 50 Hz, 4-pole turbo generator of rating 20 MVA, 13.2 kV has an inertia constant of 9 kW-sec/kVA. Find the kinetic energy stored in the rotor at synchronous speed.
11. Briefly explain the phenomenon of SSR.

(4 × 5 = 20 marks)

Part C

12. Explain the formation of Y_{bus} using singular transformation technique.

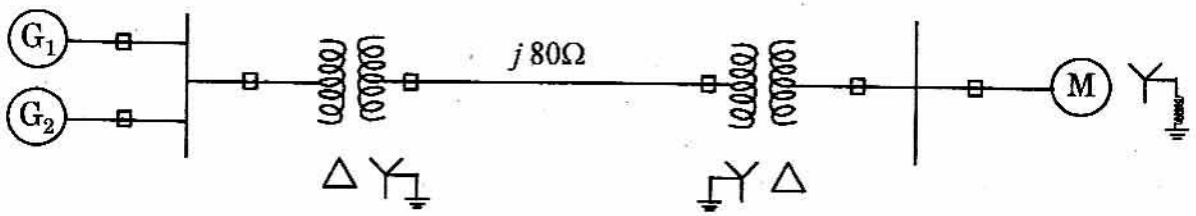
Or

13. For the system shown in Figure below draw the p.u. reactance diagram. The ratings of the components are under. Neglect resistance and use a base of 50 MVA, 132 kV in 80 Ω line.

Generator G1 and G2 : 25 MVA, 11kV, X" = 0.15 p.u.;

Synchronous motor M : 15 MVA, 12.5 kV, X" = 0.12 p.u.

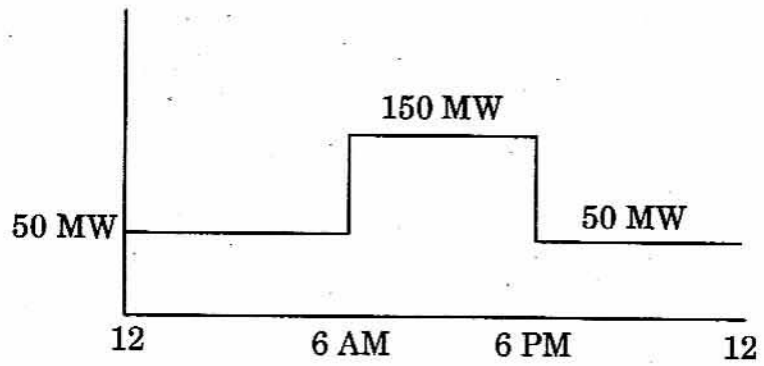
Transformer T1 and T2 : 13kV/132 kV, 132kV/13 kV and X = 0.20 p.u, 30 MVA ; Line $X_{TL} = j80$ ohms.



14. Assume that the fuel input in Btu per hour for units 1 and 2 are given by

$F_1 = (8P_1 + 0.024\,P_1^2 + 80)10^6$; $F_2 = (6P_2 + 0.04\,P_2^2 + 120)10^6$.

The maximum and minimum loads on the units are 100 MW and 10 MW resp. Determine (i) Generation schedule. (ii) The savings in the cost of generation with the generation schedule as in (i) and equally divided when the following load is supplied. The cost of fuel is Rs. 2 per million Btu.



Or

15. With help of neat diagram explain the automatic voltage regulation of power system and obtain its transfer function.

16. A 25 MVA, 13.2 kV alternator with solidly grounded neutral has a subtransient reactance of 0.25 p.u. The negative and zero sequence reactance are 0.35 and 0.1 p.u. respectively. A single line to ground fault occurs at the terminals of an unloaded alternator ; determine the fault current and the line to line voltage.

Or

17. Explain how line to line fault through impedance is analyzed at the terminals of an unloaded generator ?

18. Derive the swing equation from the fundamentals and hence explain the equal area criterion.

Or

19. Two power stations A and B are located close together. Station A has four identical generator sets each rated 100 MVA and having an inertia constant of 10 MJ/MVA whereas the station B has 3 sets each rated 200 MVA, 5 MJ/MVA. Calculate the inertia constant of a single equivalent machine on a base of 100 MVA.

(4 × 10 = 40 marks)