Code No: 117GQ **R13**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year I Semester Examinations, April/May - 2018
POWER SYSTEM OPERATION AND CONTROL
(Electrical and Electronics Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

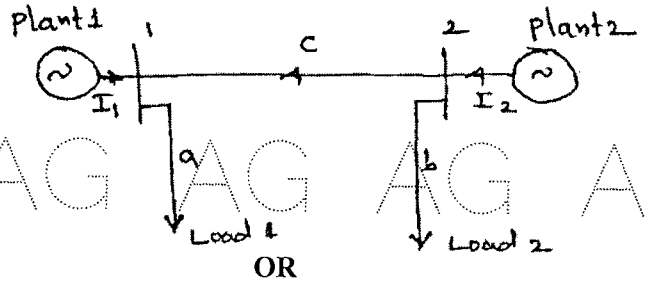
1.a) Draw the input-output characteristics of a Thermal plant. [2]
b) What is an Incremental fuel Cost? [3]
c) Mention some of the advantages of interconnection of areas. [2]
d) Name different methods for solving hydro thermal scheduling. [3]
e) Which factors decide the loading of generating stations? [2]
f) Explain D.C excitation system and A.C excitation system. [3]
g) Why Proportional plus Integral control of single area is required? [2]
h) What do you understand by economic dispatch control? [3]
i) What will be steady state frequency error of a controlled isolated power system? [2]
j) List out the advantages of Static VAR compensator. [3]

PART-B

(50 Marks)

2.a) Write step by step procedure for computing economic allocation of generation in a thermal station.

b) For the system shown in figure, with bus 1 as reference and with a voltage of 1.0V $\angle 0^0$ pu, find the loss formula co-efficient if the branch currents and impedances are: Ia=1.00+j0.15 p.u; Za=0.02+j0.15 p.u Ic =0.20-j0.05 p.u; Zc =0.02+ 10.25pu. If the base is 100 MVA, what will be the magnitudes of B – coefficients in reciprocal MW? [5+5]



OR

3.a) Give various advantages of general loss formula and state the assumptions made for calculating B_{mn} coefficients.

b) In a thermal power station, incremental costs are given by the following equations:

$dc1/dp1 = Rs. (0.15P_1 + 12)$;
$dc3/dp3 = Rs. (0.21P_3 + 13)$;
$dc2/dp2 = Rs. (0.05P_2 + 14)$.

Where P1, P2 and P3 are the loads in MW. Determine the economical load allocation between the three units, when the total load on the station is 300 MW. [5+5]

4.a) Explain clearly the mathematical formulation of optimal scheduling of hydrothermal system with a typical example.

b) Two generators rated 300 MW and 400 MW respectively are operating in parallel. The droop characteristics of their governors are 4% and 6% respectively from no load to full load. The speed changers of the governors are set so that a load of 400 MW is shared among the generators at 50 HZ in the ratio of their ratings. What are the no load frequencies of the generators? [5+5]

OR

5.a) Explain clearly the mathematical formulation of optimal scheduling of hydrothermal system with a typical example.

b) In a two plant operation system, the hydro plant is operated for 10 hrs, during each day and the steam plant is to operate all over the day. The characteristics of the steam and hydro plants are:

$CT = 0.04\ PGT^2 + 30\ PGT + 10$ Rs./hr
$WH = 0.12\ PGH^2 + 30\ PGH\ m^3/sec$

When both plants are running, the power owned from steam plant to load is 150 MW and the total quantity of water is used for the hydro plant operation during 10 hrs is $150 \times 10^6\ m^3$. Determine the generation of hydro plant and cost of water used. Neglect the transmission losses. [5+5]

6. Obtain the mathematical modeling of speed governing system. [10]

OR

7. Obtain the transfer function and block diagram representation of First order turbine model. [10]

8.a) Derive the expression for analysis of integral control for steady state response.

b) With a first order approximation, explain the dynamic response of an isolated area for load frequency control. [5+5]

OR

9.a) With a neat block diagram explain the load frequency control for a single area system.

b) The two area system has the following data:
Capacity of area 1, Pr1 =1000 MW,
Capacity of area 2, Pr2 =2000 MW,
Nominal load of area 1, PD1=500 MW
Nominal load of area 1, PD1=1500 MW
Speed regulation of area 1=4%
Speed regulation of area 2=3%
Find the new steady state frequency and change in the line for a load change of area 2 by 125 MW. For both the areas each percent change in frequency causes 1 percent change in load. Find also the amount of additional frequency drop if the interconnection is lost due to certain reasons. [5+5]

10.a) Explain clearly what you mean by compensation of line and discuss briefly different methods of compensation.

b) With a neat sketch, explain how a STATCOM works. [5+5]

OR

11.a) Name the reasons for variation of voltages in power systems and explain any one method to improve voltage profile.

b) A 440V, 3-Ø distribution feeder has a load of 100 KW at lagging p.f. with the load current of 200A. If the p.f. is to be improved, determine the following:
i) Uncorrected p.f. and reactive load
ii) New corrected p.f. after installing a shunt capacitor of 75 KVAR. [5+5]

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