Code No. 6405 / N

FACULTY OF ENGINEERING

B.E. 4/4 (EEE) I-Semester (New) (Main) Examination, November 2013

Subject : Power System Operation and Control

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

Note: Answer all questions of Part - A and answer any five questions from Part-B.

PART – A (25 Marks)

1. In a two bus system, the bus voltages and currents are given as $\bar{V}_{BUS} = \begin{bmatrix} 1.848\angle 67.5^o \\ 1.158\angle 117.2^0 \end{bmatrix}$ and $\bar{I}_{BUS} = \begin{bmatrix} 2\angle 0^o \\ 2\angle 45^o \end{bmatrix}$. Then find [$Y_{BUS}$] (3)
2. Mention the advantages of Y_{BUS} over Z_{BUS} with respect to the modeling of a power system for load flow studies. (2)
3. Draw the (i) Input -output curve (ii) Incremental fuel cost curve of a typical thermal unit. (2)
4. Write an algorithm for digital computer solution of an economic dispatch problem. (3)
5. Distinguish between flat frequency control and that tie-linefrequency control. (2)
6. Two turbo alternators rated for 120 MW and 210 MW have governor drop characteristics of 5 % from no load to full load. They are connected in parallel to share a load of 250 MW . Determine the load shared by each machine assuming free governor action. (3)
7. Define steady state stability limit of a power system network. (2)
8. A 50 Hz, 4 pole turbo generator rated 100 MVA, 11kV has an inertia constant of 80 MJ/MVA. If the mechanical input is suddenly raised to 80 MW for an electrical load of 50 MW, find rotor acceleration. Neglect losses. (3)
9. Establish the relationship between incremental changes of Q, P and V in a node. (3)
10. What is reactive power compensation? (2)

PART – B (50 Marks)

11. For the system of figure 1. Find the voltages at the receiving end bus at the end of the first iteration. Load is 2 + j0.8 pu voltage at the sending end (slack) bus is 1+j0.0pu. Line admittance is 1.0 - j4.0pu. Transformer reactance is j0.4 pu. Off-nominal turns ratio is 1/1.04. Use Gauss seidel method. Assume $V_R = 1\angle 0^o$. (10)

Figure 1

12. The losses in the lines shown in Figure 2 are proportional to the square of the power flow. Both units are loaded at 250 MW. Due to transmission loss 12.5MW of power is lost. Where should the extra 12.5 MW be generated for economic operation? Attempt a rescheduling to minimize the transmission loss. (10)

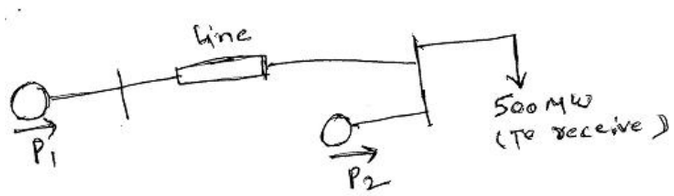

Figure 2

Give that line loss = $.000^2\ p^2$, w;
$F_1(p_1) = F_2(p_2) = 400 + 7p + .002p^2$ and
$p_1 \begin{bmatrix} \min = 70MW \\ \max = 400MW \end{bmatrix}$ and $p_2 \begin{bmatrix} \min = 70MW \\ \max = 400MW \end{bmatrix}$

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Code No. 6174 / O

FACULTY OF ENGINEERING

B.E. 4/4 (E&EE) I – Semester (Old) Examination, November 2013

Subject : Power System Operation and Control

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

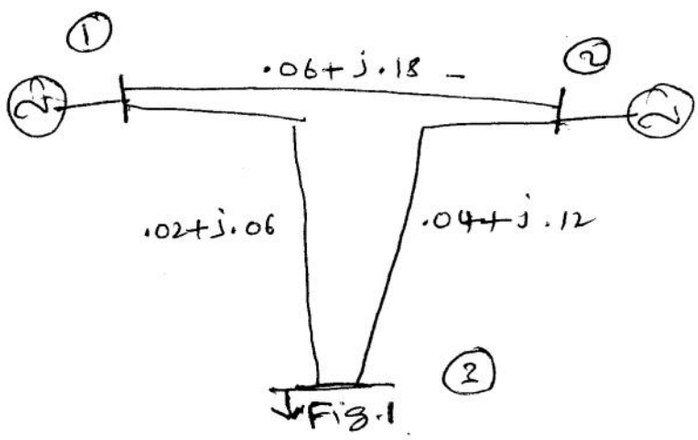
Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1. Compare GS and NR methods of load flow studies. 3
2. Write the importance of swing bus. 2
3. Draw i) input-output curve ii) Heat rate curves of a thermal power plant. 2
4. Derive the condition for optimum operation of thermal plant units, without considering transmission line losses. 3
5. What do you meant by flat frequency regulation? 2
6. Distinguish between load frequency control and economic dispatch control. 3
7. A 50 Hz, 4-pole turbo generator of rating 20 MVA, 13.2 KV has an inertia constant of H = 9 kw-sec/KVA. Find the kinetic energy stored in the rotor at synchronous speed. 3
8. Find the frequency of oscillation for a synchronizing coefficient of 0.6, inertia constant H = 4 and the system frequency is 50 Hz. 2
9. What is the necessity of maintaining a constant voltage level at a load bus? 3
10. Draw the schematic diagram and STATCOM. 2

PART – B (50 Marks)

11. Determine the voltages at all the buses of a network shown in fig.1 use Gauss-Seidel method.



Bus1 : slack bus V = 1.06 + j0.0
Bus2 : voltage controlled (PV) Bus |V| = 1+j0.0 , Pg = 0.2 Pu
Bus3 : Load bus (PQ) : P_L = 0.6 Pu ; Q_L = 0.25 Pu 10

..2

12. A two bus system is shown in fig.2. It a load of 125MW is transmitted from plant1 to the load, a loss of 15.485 MW is incurred. Determine the generation schedule and the load demand if the cost of received power is as 24/MWhr. The incremental production costs of the plants are 10

$$\frac{dF_1}{dP_1} = .025\,P_1 + 15; \qquad \frac{dF_2}{dP_2} = .05\,P_2 + 20.$$

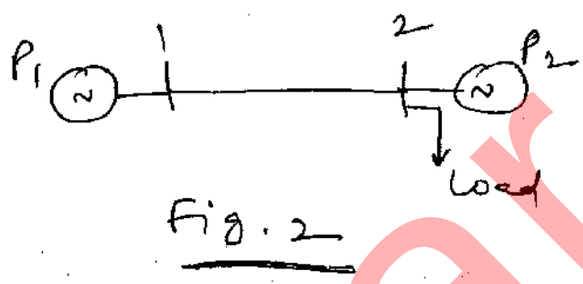


Fig. 2

13. A generator operating at 50 Hz delivers 1 P.u power to an infinite bus when a fault occurs which reduces the maximum power transferable to 0.4 P.u. Whereas the maximum power transferable before the fault was 1.75 P.u. and is 1.25 P.u. after the fault is cleared. Determine the critical clearing angle. Given H = 4 P.u. 10

14. From fundamentals obtain the block diagram of a two-area controlled power system network. 10

15. Explain any two automatic voltage regulators used in the power system network with the help of a neat diagram. 10

16. Derive the transmission loss formulae for a system consisting of n-generating plants supplying several loads interconnected through a transmission network. 10

17.a) Draw the flow chart for a developed load flow method. 5

b) Explain about tie line bias control method. 5

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