Code No. : **6174/O/S**

FACULTY OF ENGINEERING
B.E. 4/4 (E&EE) I Semester (Old) Examination, July 2014
POWER SYSTEM OPERATION AND CONTROL

Time : 3 Hours] [Max. Marks : 75

Note : *Answer **all** questions of Part – **A**.*
*Answer **five** questions from Part – **B**.*

PART – A

1. What is load flow solution ? Explain its significance in Power System Analysis. **3**
2. Write the approximations made for evaluating Jacobian element in fast decoupled load flow method. **2**
3. Define :
   i) Incremental fuel rate
   ii) Incremental efficiency of a unit of Thermal power plant. **2**
4. Determine the incremental cost of received power and penalty factor of the plant shown in Fig. 1, if the incremental cost of production is $\frac{dF_1}{dP_1} = .2P_1 + 2.8$ RS/MWhr. **3**

Fig. 1

5. List out the advantages of pool operation. **3**
6. What is the necessity of maintaining frequency of a power system network with in the strict limits ? **2**
7. A 50-Hz, 4-pole turbo generator of rating 20 MVA, 15.6 kV has an inertia constant of H = 10 kW.sec./KVA. Find the kinetic energy stored in the rotor at synchronous speed. **3**
8. What is steady state stability limit ? **2**
9. Classify FACTS controllers. **3**
10. Draw the schematic diagram of UPFC. **2**

PART – B

11. Determine the voltages at all the buses of the network shown in Fig. 2. Use Gauss seidel method.

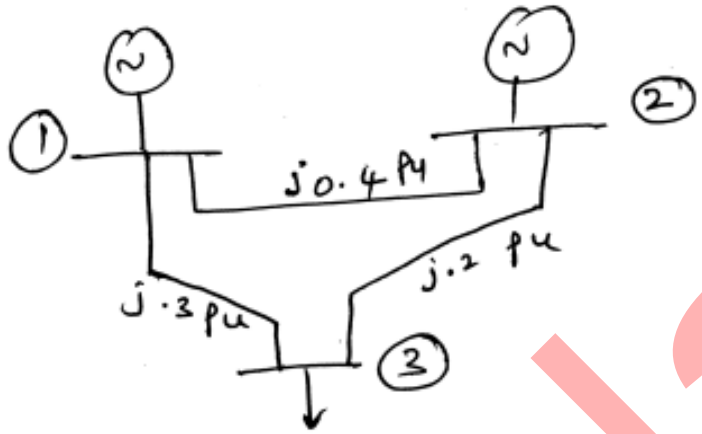

Fig. 2

Bus 1 : Slack Bus, V = 1.05 $\angle$0° p.u

Bus 2 : PV Bus, | V | = 1.0 Pu, Pg = 3.Pu

Bus 3 : PQ Bus, P_L = 4 Pu : Q_L = 2. P.u. **10**

12. From fundamentals obtain the block diagram representation of a single area controlled power system network. **10**

13. Incremental fuel costs in Rs. per megawatt hour for two units in a plant are given by $\frac{dF_1}{dP_1} = 0.1P_1 + 20$; $\frac{dF_2}{dP_2} = 0.12\ P_1 + 16$;

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 the load between units for the minimum cost when the loads are

i) 100 MW ii) 150 MW.

Neglecting the transmission line losses. **10**

14. a) Derive Swing equation. **5**

b) A 2 pole 50 Hz, 11 kV turbo alternator has a rating of 100 MW, power factor 0.85 lag. The rotor has a moment of inertia of 10,000 kg-m^2. Calculate H and M. **5**

15. Explain in detail about automatic voltage regulator with the help of a neat diagram. **10**

16. a) Derive expressions for economic distribution of load between generating units considering the effect of transmission losses. **5**

b) What is equal area criterion ? Discuss its application and limitations in the study of power system stability. **5**

17. a) Step by step solution of Swing equation. **5**

b) Draw the flow chart for a fast decoupled load flow method. **5**

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