Total No. of Questions : 10]

SEAT No. :

P3133

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B.E. (Electrical Engineering)

POWER SYSTEM OPERATION & CONTROL

(2012 Pattern) (Semester - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right side indicate full marks.***
3) ***Use of electronic pocket Calculator is allowed.***
4) ***Assume Suitable data if necessary.***

Q1) a) What are the different methods to improve steady state stability? Elaborate with reasoning. **[5]**

b) Draw "D" curve of synchronous generator capability showing all the constraints with proper reasons. **[5]**

OR

Q2) a) Draw schematic diagram of STATCOM. Also give details about construction and principle of operation with its operating characteristic. **[5]**

b) A 200MVA, 11kV, 50Hz, 4-pole synchronous generator has an inertia constant of 6MJ/MVA. **[5]**

i) Find the energy stored in the rotor.

ii) The machine is operating with the load of 120MW is suddenly changed to 160MW. Find the retardation. Neglect the losses

iii) If the retardation is maintained for 5 cycles, find the change in power angle and rotor speed in rpm at the end of this period.

Q3) a) What do you mean by subsynchronous resonance? What are the different effects of subsynchronous resonance. **[5]**

b) What are different combinations used in SVC? Elaborate any two types with diagram and characteristic. **[5]**

OR

P.T.O.

Q4) a) A synchronous generator is connected to infinite bus through a transformer and transmission network. A three phase fault is occurred at generator bus bar. Derive the critical clearing angle for transient stability using equal area criteria. **[5]**

b) What are the different controllers used in reactive power compensation? Explain with suitable diagram. **[5]**

Q5) a) With suitable control system diagram, explain two area load frequency system. **[8]**

b) Two synchronous generators operating in parallel supply a total load of 200 MW. The ratings of the machines 1 and 2 are 100 MW and 200 MW. Machines 1 and 2 have governor droop characteristic of 4% and 3% respectively, from no load to full load. Assume that at full load, machines run at rated speed and the system frequency is 50 Hz. Calculate the load taken by each machine and the operating frequency. **[8]**

OR

Q6) a) Derive the formula for steady state change in frequency for change in demand, if single area load frequency control is considered to be first order system. **[8]**

b) Two generators rated 200MW and 400MW are operating in parallel. The droop characteristics of their governors are 4% and 5% respectively from no load to full load. The speed changers are so set that at operating frequency of 50Hz, the total load shared is 600MW with the ratio of their ratings. If the load reduces to 400MW, how it will be shared among the generators and what will be the operating frequency? Assume free governor operation. **[8]**

Q7) a) A generating station is having two units, the incremental cost curve of two units are given by **[8]**

$$\frac{dF_1}{dP_1} = 0.1P_1 + 20Rs / MWhr$$

$$\frac{dF_2}{dP_2} = 0.12P_2 + 16Rs / MWhr$$

For the load of 180MW determine annual saving for economical loading instead of equal loading.

b) Explain the different thermal constraints on unit commitment. **[8]**

OR

Q8) Read the following statements carefully and state whether it is true or false with proper justification. **[16]**

a) Incremental cost in economical load scheduling among the generator is different.

b) The generator is having less operating cost should share large load than other generators operating in parallel in economical load dispatch.

c) In economic load dispatch with considerable power loss, equality constraints is $\sum_{i=1}^{n} P_{Gi} = P_D$ Where P_{Gi} is generation and P_D is load

d) Once the unit is decommitted, there is minimum time required to recommit. It is known as minimum up time in thermal constraints.

Q9) a) What do you mean by power pool? What is the role of power pool in energy control? **[9]**

b) Write short note on "emergency power exchange and energy banking". **[9]**

OR

Q10)a) Define following terms **[9]**

i) SAIDI

ii) CAIDI

iii) SAIFI

b) Write short note on "capacity and diversity interchange". **[9]**