Total No. of Questions : 10] **SEAT No. :**

P3589 **[Total No. of Pages : 3**

[4959]-1061

B.E. (Electrical Engineering)

POWER SYSTEM OPERATION & CONTROL

(2012 Pattern) (Semester - I)

Time : 3 Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right indicate full marks.***
3) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data, if necessary.***

Q1) a) Find the critical clearing angle for a power system when a three phase fault occurs at the mid point of the transmission line with variation of transfer reactance as given below.

i) Pre-fault reactance = 0.71p.u.
ii) During fault reactance = 2.424 p.u
iii) Post fault reactance = 1.p.u

The generator supplies power under pre-fault condition equal to 1p.u.. with induced emf 1.2p.u. The generator is connected to infinity bus having the voltage of 1p.u. through the transmission network. **[7]**

b) What are the various problems in A.C. transmission that resulted into development of FACTS? **[3]**

OR

Q2) a) Explain the advantages of series compensation. Also state the location of capacitors used in the series compensation. **[5]**

b) Enlist the reasons for reactive power control. **[5]**

Q3) a) Describe the loading capability curve of generator. **[5]**

b) How the steady state stability and transient stability and it's limits can be determined **[5]**

OR

P.T.O.

Q4) a) Explain the effect of excitation of the synchronous generator on reactive power generation. **[5]**

b) With neat connection diagram, explain TCR and FC type shunt compensation. **[5]**

Q5) a) Explain the working of speed governor system of turbo generator with schematic diagram. Draw transfer function block diagram of speed governor system. **[6]**

b) Explain with block diagram and frequency response, proportional load frequency control of single area case for exact and first order approximated system. **[10]**

OR

Q6) a) With neat block diagram and response, explain two area load frequency control. Draw frequency response and deviation in tie line power for change in load demand of any one area. **[10]**

b) Explain with transfer function block, the generator-load model used in load frequency control. **[6]**

Q7) a) Using priority list method, prepare unit commitment table using three thermal generating units, for load values such as 400 MW, 900MW and 1100MW. **[6]**

The incremental fuel cost of three thermal units and other details are as follows :

IC1= (0.003*P1 + 7)* 10^3 k-cal/MW-hr

IC2= (0.002*P2 + 7.5) * 10^3 k-cal/MW-hr

IC3= (0.004*P3 + 8)* 10^3 k-cal/MW-hr

The minimum and maximum generation limits are

50 MW $\leq$ P1 $\leq$ 500MW

40 MW $\leq$ P2 $\leq$ 400MW

20 MW $\leq$ P3 $\leq$ 200MW

Fuel costs are in Rs/Kcal

CP1= 1.1 Rs/k-cal

CP2= 1.05 Rs/k-cal

CP3= 1.2 Rs/k-cal

b) Explain constraints on unit commitment task. **[4]**

c) Explain with mathematical formulation, Lagrange multiplier method of economic load dispatch without transmission loss and no constraint of generation limit, while meeting load. **[8]**

OR

Q8) a) Explain with suitable numerical, the solution to recursive function of dynamic programming of Unit Commitment. **[10]**

b) Explain the concept of cost curve of thermal unit. **[4]**

c) Explain equality and inequality constraints applied to economic load dispatch task. **[4]**

Q9) a) What is the Power Pool and Energy Banking? Explain the benefits of each. **[8]**

b) With Mathematical formula, explain the following customer oriented reliability indices. **[8]**

i) SAIFI
ii) SAIDI
iii) CAIDI
iv) AENS

OR

Q10)a) Explain following mode of power transaction. **[8]**

i) Emergency power interchange
ii) Inadvertent power exchange

b) Explain following models required to evaluate the reliability indices of generation system. **[8]**

i) Generator Model
ii) Load Model
iii) Risk Model