Total No. of Questions : 10]

SEAT No. :

P3315

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B.E. (Electrical Engg.)

POWER SYSTEM OPERATION & CONTROL

(2015 Course) (Semester - I) (End Sem.) (403141)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer five questions : Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if required.***
5) ***Use of electronic nonprogrammable calculator is allowed.***

Q1) a) Discuss the use of swing equation of synchronous machine in power system stability study. **[5]**

b) Describe the concept of sub synchronous resonance and reasons of its occurrence. **[5]**

OR

Q2) a) Derive the expression of critical clearing angle and critical clearing time. **[6]**

b) Enlist and describe in brief the methods for improvement of transient stability limit. **[4]**

Q3) a) Explain the circuit, VI characteristics, advantages and limitations of TCSC. **[8]**

b) State the criteria applied while using series and shunt compensation. **[2]**

OR

Q4) a) Elaborate the point by point method used in power system stability studies. **[6]**

b) Explain the use of synchronous condenser for reactive power management. **[4]**

Q5) a) With block diagram of proportional plus integral load frequency control, explain the dynamic response of change in frequency as function of change in load, in case of single area case. **[10]**

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b) Explain following concepts with reference to Automatic Generation Control (AGC) **[8]**

i) Single Control Area

ii) Free Governor Mode of operation

iii) Area Control Error in single area case

iv) Area Control Error in two area case

OR

Q6) a) With block diagram of Load frequency control of two area case, explain the dynamic response of change in frequency as well as tie line power as a function of change in load. **[10]**

b) Draw and explain the working of speed governor system of turbo generator. **[8]**

Q7) a) Define Unit Commitment. Enlist the methods to solve Unit Commitment. Explain the recursive function used in dynamic programming of UC task. **[8]**

b) Use dynamic programming and obtain the Unit Commitment table of two genarating units of load demand of 2MW and 3MW. The cost curve of each generating unit is given. The load is changed in a step of 1MW. **[8]**

$$C_1 = 0.8 * P_1^2 + 25 * P_1 + 120$$

$$C_2 = 1.2 * P_2^2 + 22 * P_2 + 100$$

OR

Q8) a) Define Economic Load Dispatch. Explain the use of Lagrange multiplier technique to solve load dispatch problem in case of including generator limit and without including transmission line loss. **[8]**

b) The cost curve of three thermal units in Rs/hr, are given as follows; **[8]**

$$C_1 = 0.004 * P_1^2 + 5.3 * P_1 + 500$$

$$C_2 = 0.006 * P_2^2 + 5.5 * P_2 + 400$$

$$C_3 = 0.009 * P_3^2 + 5.8 * P_3 + 200$$

Neglect the transmission loss and generator limits. Find the optimum dispatch of 800 MW and 975 MW using coordination equation.

Q9) Write short note on any 4 of following. **[16]**

a) Economy interchange evaluation in case of interconnected systems

b) Energy Banking

c) Power Pool

d) Capacity Interchange

e) Diversity Interchange

OR

Q10)a) Define the reliability of power system. Calculate the system failure rate -λ_{para}, Unavailability - U_{para} and interrruption duration - r_{para} of parallel distribution system. The data of two lines is given as follows **[6]**

$\lambda_1 = 0.5$/yr, $\lambda_2 = 1$/yr, $r_1 = 25$hrs, $r_2 = 10$ hrs

b) Along with mathematics, discuss the reliability evaluation of following indices; **[10]**

i) Loss of load probability(LOLP)

ii) Loss of load expectation(LOLE)

iii) Expected Energy Not Supplied(EENS)

iv) System Average Interruption Frequency Index(SAIFI)

v) System Average Interruption Duration Index(SAIDI)

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