Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–VII • EXAMINATION – WINTER • 2014

Subject Code: X 70902 Date: 01-12-2014

Subject Name: Interconnected Power Systems

Time: 10:30 am - 01:00 pm Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 (a) Explain the algorithm for formulation of Y_{BUS} matrix assuming no mutual coupling between transmission lines. What modifications are required if mutual coupling is taken into consideration? **(7)**

(b) Derive the expression for most economic dispatch when transmission losses are neglected **(7)**

Q.2 (a) With the help of a neat diagram explain turbine speed governing system **(7)**

(b) Derive swing equation for a synchronous machine **(7)**

OR

(b) Explain equal area criteria of stability **(7)**

Q.3 (a) With the help of flowchart explain GS method of load flow **(8)**

(b) Classify and explain different types of buses in power system **(6)**

OR

Q.3 (a) What is unit commitment? Explain how dynamic programming method can be used to solve unit commitment problem **(8)**

(b) On a system consisting of two generating plants, the incremental costs in Rs/MWhr are **(6)**

$dC_1/dP_1 = 0.15P_1 + 150$

$dC_2/dP_2 = 0.25P_2 + 175$

The system is operating on economic dispatch with $P_1 = P_2 = 200$ MW and $\delta P_L/\delta P_2 = 0.2$ Find the penalty factor of plant 1

Q.4 (a) A generator is supplying power to an infinite bus through two parallel lines. A fault occurs at the sending end of one of the transmission line which causes it to trip. After some time the fault is cleared and generator continues to supply power through one transmission line. Derive the formula for critical clearing angle **(8)**

(b) A power system has a maximum steady state stability limit of 100 MW. If it is supplying a load of 50 MW what is the sudden increase in load permissible if the transient stability of the system is to be maintained? Use graphical method **(6)**

OR

Q.4 (a) Explain numerical solution of swing equation **(8)**

(b) A 50 Hz generator of reactance 1.0 pu is connected to an infinite bus through a line of reactance 0.5 pu, E = 1.1 pu and V = 1.0 pu. The inertia constant is 5 MW-sec/MVA. The The generator is loaded to 75% of the maximum power limit. Find the frequency of natural oscillations. **(6)**

Q.5 (a) Explain tie line load bias method of frequency control **(7)**

(b) Explain network islanding and cascade tripping **(7)**

OR

Q.5 (a) State and explain different methods for improving stability of power system **(7)**

(b) Two generators rated 200 MW and 400 MW are operating in parallel. The droop characteristics of their generators are 4% and 5% respectively from no load to full load. Assuming that generators are operating at 50 Hz at no load, how would a load of 600 MW be shared between them? What will be the system frequency at this load? Assume free governor operation. **(7)**

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