Hall Ticket Number:

Code No. : 41211

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (E.E.E.) IV Year I-Semester Main Examinations, December-2017

Power System Operation Control

Time: **3** hours Max. Marks: **70**

*Note: Answer **ALL** questions in **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

1. What is meant by incremental cost curve?
2. Why economic dispatch is essential in power system operation?
3. What is the significance of minimum up and minimum down times?
4. Is Unit commitment done online or offline? What is the objective function?
5. What is necessity of automatic voltage regulator?
6. State the condition for load sharing between two synchronous generators operating in parallel.
7. Differentiate between rotor angle stability and voltage stability.
8. If the maximum power P_{max}= 50 MW find the electrical power output for a torque angle of 60 degrees.
9. Why voltage control is necessary?
10. Differentiate between the function of TCSC and STATCOM.

Part-B (5 × 10 = 50 Marks)
(All bits carry equal marks)

11. a) Derive coordination equation for economic dispatch including losses, in the power system.

    b) The fuel cost functions for three thermal plants in $/h are given by $F_1=0.004Pg_1^2+5.3Pg_1+500$; $F_2=0.006Pg_2^2+5.5Pg_2+400$; $F_3=0.009Pg_3^2+5.8Pg_3+200$; where Pg_1, Pg_2, Pg_3 are in MW. Estimate the optimal dispatch and the total cost when the total load is 925 MW with the following generator limits. $100MW \le Pg_1 \le 450MW$, $100MW \le Pg_2 \le 350MW$, $100MW \le Pg_3 \le 225MW$.

12. a) Demonstrate how the dynamic programming approach can be used for the solution of Unit Commitment Problem.

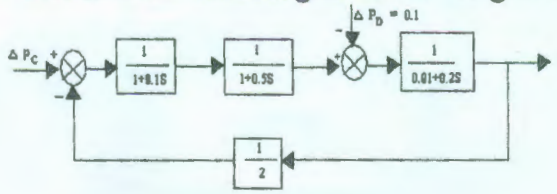
    b) Explain the Lagrangian relaxation method for the solution of Unit Commitment problem.

13. a) Analyze the operation of speed governor mechanism model with the speed load characteristics.

    b) In the single area system shown below determine the steady state frequency error, with

    i) $\Delta P_c = 0$

    ii) $\Delta P_c = -\int K \Delta f$, where K is the Critical gain of the integral controller



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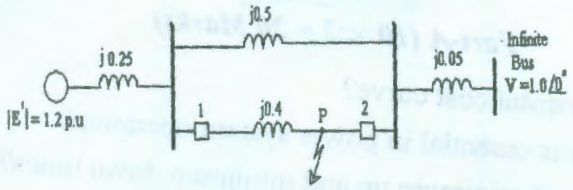
14. a) What are the advantages of V-Q curves for studying voltage stability? Explain how you obtain a reactive power margins.

    b) A three-phase fault occurs at the point P as shown in the figure. Find the critical clearing angle for clearing the fault with simultaneous opening of the breakers 1 and 2. The reactance value of various components are indicated on the diagram. The generator is delivering 1.0pu power at the instant preceding the fault.



15. a) Explain how the power factor can be controlled in a system.

    b) Explain the functioning of a series FACTS controller.

16. a) What is the significance of equality and inequality constraints in economic dispatch solution? Describe the objective function and cost co-efficients.

    b) Explain the Unit commitment problem in power system operation.

17. Answer any *two* of the following:

    a) Explain the tie line bias control.

    b) Explain the terms steady state stability, dynamic stability, transient stability and voltage stability.

    c) Explain the operation of UPFC.

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