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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Eighth Semester, B.E. - Electrical and Electronics Engineering

Semester End Examination; July - 2023

Power System Operation and Control

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: Understand about computer control centers to control power systems, timeline power flow, frequency deviation.

CO2: Design and develop different system models to Load-Frequency control, Single area control and two area control methods.

CO3: Understand the different methods of controlling voltage, Different methods inject reactive power and working of tap changing transformer in voltage control.

CO4: Understand the need of unit commitment and different constraints in unit commitment.

CO5:Study about power system security, different methods to get the solution of network problems

***Note**: I) **PART - A** is compulsory. **Two** marks for each question.*

*II) **PART - B**: Answer any **Two** sub questions (from a, b, c) for a Maximum of **18 marks** from each unit.*

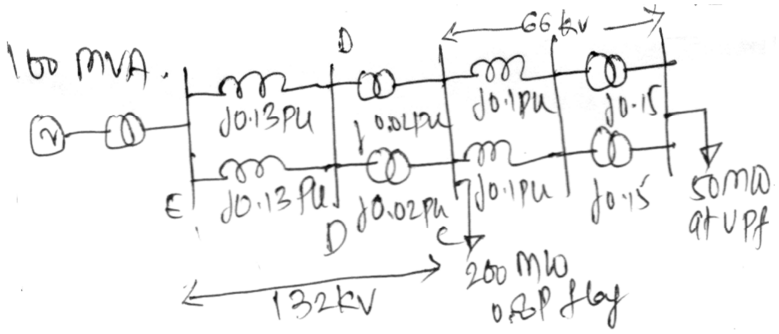
Q. No.	Questions	Marks	BLs	COs	POs
	I : PART - A	**10**			
1 a.	What is the function of tie line in interconnected power system?	2	L1	CO1	PO1
b.	What is the function of fly ball and speed changer in speed governor?	2	L1	CO2	PO1
c.	What are the different methods used to improve voltage at a bus?	2	L1	CO3	PO1
d.	What is the advantage of dynamic programming in unit commitment?	2	L1	CO4	PO1
e.	What are the factors that affect security of power system?	2	L1	CO5	PO1
	II : PART - B	**90**			
	UNIT - I	**18**			
2 a.	Derive an expression for tie line power flow and frequency deviation for two area power system.	9	L3	CO1	PO1
b.	Explain the parallel operation of generator; (i) Two units with different speed settling (ii) Two different generator operated in parallel	5+4	L2	CO1	PO1
c.	Two synchrnous generators are; (i) Initially supplying a common load at 1 P.U frequency (50 Hz). The retry of unit 1 is 447 MW and has 0.03 P.U droop built into its governor. Unit 2 is rated 400 MW and has 0.05 PU droop. Find each unit share of 0.10 P.U increase in the load demand. Also find the new line frequency. (ii) Explain control feature available to the operator.	5+4	L3	CO1	PO1,2

UNIT - II **18**

3 a.	Drive the mathematical model of the speed governing system.	9	L3	CO2	PO1,2
b.	Obtain an expression for steady state change in system frequency for a step change in load demand, assure free governor operation.	9	L3	CO2	PO1,2
c.	With a schematic diagram, explain the alternator voltage regulator scheme.	9	L2	CO2	PO1

UNIT - III **18**

4 a.	Explain in detail the components of power system that can generate and absorb reactive power.	9	L2	CO3	PO1
b.	Derive necessary equation to prove that voltage at load point depends on reactive power consumed by load and real power depends in delta (load angle).	9	L3	CO3	PO1,2
c.	Determine the power supplied by generator and the power factor at which generator must operator for the circuit shown in Fig. 3 (c) Assume base MVA as 100 MVA.	9	L3	CO3	PO1,2



UNIT - IV **18**

5 a.	Explain the priority list method of unit commitment with an example, write necessary flowchart.	9	L2	CO4	PO1
b.	(i) Explain the different constraint involved in unit commitment (ii) What is the difference between unit commitment and economic load dispatch?	6+3	L2	CO4	PO1
c.	Construct a priority list for three units for the data given below:	9	L3	CO4	PO1,2

Unit	Full load avg. production cost Rs/MWH	P_G^{min} MW	P_G^{max} MW
1	$0.003124Pg_1+7.92$	150	600
2	$0.00213Pg_2+7.2$	100	400
3	$0.00142Pg_3+8.1$	50	200

	UNIT - V	**18**			
6 a.	With flowchart, explain AC power flow security analysis with contingency case selection.	9	L2	CO5	PO1
b.	(i) Explain power transfer distribution factor and line outage distribution factor in contingency analysis. (ii) Mention the factors / steps considered in security of power system analysis.	9	L3	CO5	PO1
c.	Explain security constraint optimal power flow with an example.	9	L2	CO5	PO1

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