CBCS SCHEME

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18EE81

Eighth Semester B.E. Degree Examination, Jan./Feb. 2023
Power System Operation and Control

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. With a neat diagram, explain the general configuration and major components of SCADA system. **(10 Marks)**

b. Explain in detail, the operating states of power system with a neat diagram showing transition between states. **(10 Marks)**

OR

2 a. Discuss the preventive and emergency control. **(06 Marks)**

b. Explain the major components of energy management center. **(06 Marks)**

c. Draw the typical diagram of RTU and explain major subcomponents. Discuss the standard protocols used in SCADA. Name the SCADA manufactured for power system. **(08 Marks)**

Module-2

3 a. Derive the mathematical model ALFC components speed Governor and turbine. **(10 Marks)**

b. Given a control area with 3 generating units with following ratings :

Unit	Rating (MVA)	% R(on machine base)
1	200	0.01
2	500	0.025
3	750	0.04

The units are loaded as follows: P_1 = 100MW, P_2 = 400MW and P_3 = 600MW. If load increased by 200MW, what are new generations if D = 0? Repeat for D = 1.0. **(10 Marks)**

OR

4 a. Derive the generator model, load model and combined generator load model of ALFC system. **(10 Marks)**

b. Two generators rated 200MW and 400MW are operating in parallel. The drop characteristics of their governors in 4% and 5% respectively for no-load to full load. The speed set points are such that the generator operate at 50Hz when they sharing the full load of 600MW in proportional to their rating.

i) If the load reduces to 400MW, how load is shared? At what frequency will operate?

ii) If now the speed changes are reset so that the load of 400MW is shared at 50Hz in proportional to their rating. What are no-load frequencies now? **(10 Marks)**

Module-3

5 a. Explain state space model of an Isolated system. **(10 Marks)**

b. Two area 1 and area 2 are interconnected. The capacity of area 1 is 1500MW and area 2 is 500MW. The incremental regulation and damping torque co-efficient for each on its own base are 0.2pu and 0.9pu respectively.

i) Find the steady state frequency and change in steady-state tie-line power for an increase of 60MW in area 1. The nominal frequency is 50Hz.

ii) What would be the effect of not having Governor Control? Base MVA = 1500. **(10 Marks)**

OR

6 a. Explain in detail Tie-line oscillations with assumptions made. **(12 Marks)**

b. Two generating areas have capacities of 500MW and 1000MW respectively. They are interconnected by a short line. The percentage speed regulation from no-load to full load of the two stations are 3% and 4% respectively. If the load on each station is 250MW. Find the power generation of each station and the tie – line power. **(08 Marks)**

Module-4

7 a. Explain the different methods of voltage control by reactive power injection. **(10 Marks)**

b. Three generating stations are connected to a common bus X as shown in Fig Q7(b). For a particular load, the line voltage at the bus bar falls by 2KV. Calculate the reactive power injection required to bring back the voltage to original valve. All are in pu valves on base of a 500MVA.

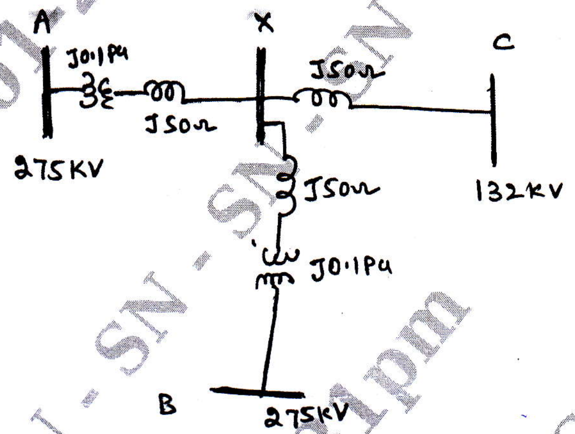

Fig Q7(b) **(10 Marks)**

OR

8 Write a short note on following :

a) Absorption to Reactive power
b) Sensitivity of Voltage
c) Tap changing transformers
d) Booster transformers **(20 Marks)**

Module-5

9 a. Explain the Power system reliability and system security levels. **(10 Marks)**

b. Explain IPIQ method for contingency Ranking. Also explain the contingency processing using AC load flow analysis with a flow chart. **(10 Marks)**

OR

10 a. Explain the formulation and state estimate using linear square estimation. **(10 Marks)**

b. Explain with neat flow chart contingency Analysis for line outage, using outage distribution factors. **(10 Marks)**

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