CBCS SCHEME

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18EE81

Eighth Semester B.E. Degree Examination, Dec.2024/Jan.2025
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. Explain the different states in which power system operates. **(10 Marks)**

b. Explain the key concepts for reliable operation of power system. **(10 Marks)**

OR

2 a. With a neat diagram describe the major components of SCADA system. **(10 Marks)**

b. Explain the classification of SCADA system based on the standard SCADA configuration. **(10 Marks)**

Module-2

3 a. Derive the generator model, load model and combined generator load model of ALFC system. **(12 Marks)**

b. Two generators rated 200 MW and 400 MW are operating in parallel. The droop characteristics of their governors are 4% and 5%, respectively from no load to full load. Assuming that the 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. **(08 Marks)**

OR

4 a. Prove that by adding a feedback of proportional integral controller to ALFC, the steady state frequency deviation is zero. **(10 Marks)**

b. With neat diagram explain the load frequency and excitation voltage regulators of a turbo-generator. **(06 Marks)**

c. A 100 MVA synchronous generator operates on full load at a frequency of 50 Hz. The load is suddenly reduced to 50 MW. Due to time lag in governor system, the steam value begins to close after 0.4 sec. Determine the change in frequency that occurs in this time. Given : H = 5 kWs/KVA of generator capacity. **(04 Marks)**

Module-3

5 a. Derive the state model of a two-area system. **(12 Marks)**

b. Explain speed governor dead-band and its effect on Automatic Generation Controller (AGC). **(08 Marks)**

OR

6 a. With a neat schematic diagram, Explain automatic voltage regulator of a generator. **(10 Marks)**

b. Two areas are interconnected. The capacity of area 1 is 1,500 MW and area 2 is 500 MW. The incremental regulation and damping torque coefficient for each area on its own base are 0.2 Pu and 0.9 Pu, respectively. Find the steady-state frequency and change in steady state tie-line power, for an increase of 60 MW in area 1. The nominal frequency is 50 Hz. **(10 Marks)**

Module-4

7 a. Prove that voltage at receiving end is dependent on reactive power in power system. **(10 Marks)**

b. Explain briefly the various elements of power system that can generate or absorb reactive power. **(10 Marks)**

OR

8 a. Explain voltage control using; tap changing transformers and booster transformers. **(08 Marks)**

b. The transmission system shown in Fig.Q.8(b). The P.u values are referred to the respective voltage bases and 100 MVA base. Determine the power supplied by the generator and its pf. **(12 Marks)**

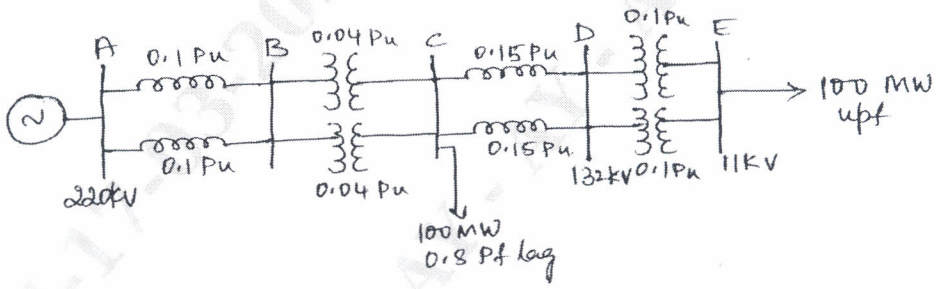

Fig.Q.8(b)

Module-5

9 a. With a neat flow chart, explain contingency analysis for generation outage using generation shift sensitivity factors. **(10 Marks)**

b. What is system security? Explain the major function involved in the system security. **(10 Marks)**

OR

10 a. Explain IPIQ method of contingency selection procedure using AC load flow analysis with a flow chart. **(10 Marks)**

b. Explain the formulation and state estimate using linear least square estimation. Also explain the condition for observability in least square estimation. **(10 Marks)**

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