CBCS SCHEME

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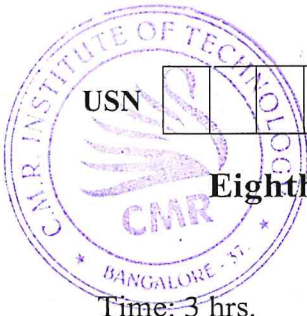
Eighth Semester B.E. Degree Examination, July/August 2022
Power System Operation and Control

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 operating states of power system, with a neat diagram. **(08 Marks)**
   b. Explain the key concepts for reliable operation of power system. **(06 Marks)**
   c. Explain the major components of energy management center. **(06 Marks)**

OR

2 a. Explain in brief the components of remote terminal unit for power system SCADA. **(08 Marks)**
   b. With usual notations, explain following with reference to SCADA systems. SCADA/AGC, EMS, DMS, LMS, AMR. **(06 Marks)**
   c. Explain single master, multiple submaster, multiple remote configuration with a neat diagram. **(06 Marks)**

Module-2

3 a. Explain in brief the function of load frequency control and excitation voltage regulators of turbo generators with a neat schematic diagram. **(06 Marks)**
   b. Draw the schematic diagram of steam turbine speed governing system and explain the functions of the various components. **(08 Marks)**
   c. Two generators rated 200MW and 400MW 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 50Hz at no load, how would a load of 600MW be shared between them? What will be the system frequency at this load? Assume free governor operation. **(06 Marks)**

OR

4 a. Explain the modeling of
      i)   Speed governor system model
      ii) Turbine model
      iii) Generator-load model. **(12 Marks)**
   b. With a neat diagram, explain the proportional plus integral controller. **(08 Marks)**

Module-3

5 a. Explain state space model of two area system. **(10 Marks)**
   b. Explain the function of important components and their transfer function of automatic voltage regulator of a generator with a neat diagram. **(10 Marks)**

OR

6   a. Explain the load frequency control with Generation Rate Constraints (GRCs) with a neat diagram. **(07 Marks)**
    b. Describe the effect of the speed governor dead band on AGC. **(07 Marks)**
    c. Explain the decentralized control in interconnected power system. **(06 Marks)**

Module-4

7   a. Explain generation and absorption of reactive power in electrical power system. **(06 Marks)**
    b. Derive the equations to get the relation between voltage, power and reactive power at a node. **(06 Marks)**
    c. Briefly explain the different methods of reactive power injection in power system. **(08 Marks)**

OR

8   a. Explain the various methods of voltage control using tap changing transformers. **(06 Marks)**
    b. What is meant by sub synchronous reactance? Briefly explain. **(06 Marks)**
    c. Three generating stations are connected to a common bus bar X as shown in Fig.Q.8(c). For a particular system load, the line voltage at the bus bar falls by 2kV. Calculate the reactive power injection required to bring back the voltage to the original value. All pu values are on a 500MVA base. **(08 Marks)**
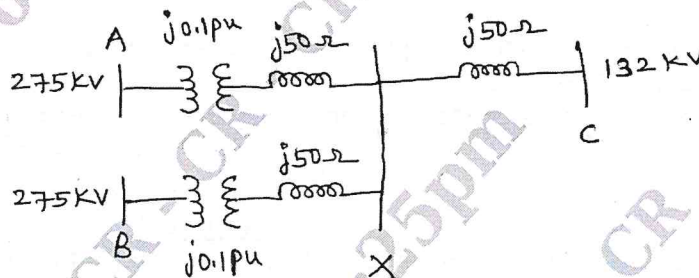

Fig.Q.8(c)

Module-5

9   a. Explain the factors affecting power system security. **(04 Marks)**
    b. With the help of flow chart, explain the contingency analysis. **(08 Marks)**
    c. Explain calculation of linear sensitivity factors with the help of flow chart. **(08 Marks)**

OR

10 a. Explain major functions involved in system security. **(06 Marks)**
    b. Explain the formulation and state estimate using linear least square estimation. Also explain the condition for observability in least square estimation. **(08 Marks)**
    c. With the help of flow chart, explain the AC power flow security analysis with contingency case selection. **(06 Marks)**

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