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# B.M.S. College of Engineering, Bengaluru-560019

**Autonomous Institute Affiliated to VTU**

## January / February 2025 Semester End Main Examinations

**Programme: B.E.** **Semester: VII**

**Branch: Electrical and Electronics Engineering** **Duration: 3 hrs.**

**Course Code: 22EE7PCPSO** **Max Marks: 100**

**Course: Power System Operation and Control**

**Instructions**: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

**Important Note:** Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

| | | | UNIT - I | *CO* | *PO* | Marks |
|---|---|---|---|---|---|---|
| 1 | a) | | Discuss the applications of PMUs in wide-area monitoring and control of power systems | *CO1* | *PO1* | **06** |
| | b) | | What are the main functions of an Energy Control Centre in power system management? | *CO1* | *PO1* | **06** |
| | c) | | Explain the main components of a SCADA system in the context of power systems. | *CO1* | *PO1* | **08** |
| | | | **OR** | | | |
| 2 | a) | | What are the conditions required for paralleling two generators, and why are they important? | *CO1* | *PO1* | **06** |
| | b) | | What is the speed governing mechanism, and why is it important in power generation? | *CO1* | *PO1* | **06** |
| | c) | | What is SCADA in power systems, and what are its key components? Explain their functions. | *CO1* | *PO1* | **08** |
| | | | **UNIT - II** | | | |
| 3 | a) | | Two interconnected Area-1 and Area-2 have the capacity of 2,000 and 500 MW, respectively. The incremental regulation and damping torque coefficient for each area on its own base are 0.2 p.u. and 0.8 p.u., respectively. (i) Find the steady-state change in system frequency from a nominal frequency of 50 Hz and the change in steady-state tie-line power following a 750 MW change in the load of Area-1. (ii) Determine the frequency and tie-line power following a change in load by 75 MW in area 2. | *CO2* | *PO2* | **14** |
| | b) | | What is load frequency control, and how does it work in interconnected power systems? | *CO2* | *PO1* | **06** |
| | | | **OR** | | | |
| 4 | a) | | Explain the LFC model for a two-area system with its block diagram. | *CO2* | *PO1* | **10** |

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|---|---|---|---|---|---|---|
| | | b) | Derive an expression for tie-line power flow in a two-area system. | *CO2* | *PO4* | **10** |
| | | | **UNIT - III** | | | |
| | 5 | a) | Explain the effect of voltage drop in transmission line. | *CO2* | *PO1* | **10** |
| | | b) | Describe different methods for reactive power compensation for voltage stability enhancement. | *CO2* | *PO1* | **10** |
| | | | **OR** | | | |
| | 6 | a) | Explain the generation and absorption of reactive power in power systems. | *CO2* | *PO1* | **10** |
| | | b) | Explain the Automatic Voltage Regulator system with a neat diagram. | *CO2* | *PO1* | **10** |
| | | | **UNIT - IV** | | | |
| | 7 | a) | Explain the concept of spinning reserves in Unit Commitment and its impact on scheduling | *CO4* | *PO1* | **06** |
| | | b) | Discuss the operational constraints of thermal and hydroelectric power plants. | *CO4* | *PO1* | **06** |
| | | c) | Explain the Priority List Method for solving the Unit Commitment problem and list its advantages. | *CO2* | *PO1* | **08** |
| | | | **OR** | | | |
| | 8 | a) | Explain the Forward Dynamic Programming approach in Unit Commitment and list its merits and demerits. | *CO2* | *PO4* | **10** |
| | | b) | The cost characteristics of three units in a power plant are given by<br>$C1 = 0.5\ P_1^2 + 220\ P_1 + 1800$ Rs / hour<br>$C_2 = 0.6\ P_2^2 + 160\ P_2 + 1000$ Rs / hour<br>$C_3 = 1.0\ P_3^2 + 100\ P_3 + 2000$ Rs / hour<br>where $P_1$, $P_2$ and $P_3$ are generating powers in MW. Maximum and minimum loads on each unit are 125 MW and 20 MW respectively. Obtain the priority list when the total load is 260 MW. | *CO4* | *PO2* | **10** |
| | | | **UNIT - V** | | | |
| | 9 | a) | What is power system security, and why is it important? | *CO2* | *PO1* | **06** |
| | | b) | Differentiate between preventive and corrective controls in power system security. | *CO2* | *PO1* | **06** |
| | | c) | Explain the system state classification w.r.t. security of power system with block diagram. | *CO2* | *PO1* | **08** |
| | | | **OR** | | | |
| | 10 | a) | Explain the Generation Shift Distribution Factor (GSDF) and Line Shift Distribution Factor (LSDF) and its application in power system security. | *CO2* | *PO2* | **10** |
| | | b) | Explain the steps involved in contingency analysis in detail. | *CO2* | *PO1* | **10** |

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