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**SUBJECT CODE NO:- H-150**  
**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**B.E. (EEP/EE/EEE)**  
**Power System Operation & Control**  
**(REVISED)**

**[Time: Three Hours]****[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B

1. Q.No.1 from section A and Q.No.6 from section B are compulsory.
2. Attempt any two questions from the remaining questions in each section
3. Assume suitable data whenever necessary.

## Section A

- |     |                                                                                                                                                                                                                                                                                                                                                                                   |          |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Q.1 | Solve any five questions.                                                                                                                                                                                                                                                                                                                                                         | 10       |
|     | <ol style="list-style-type: none"> <li>a) Define the direct and quadrature axes.</li> <li>b) What are the significance of dq0 transformation.</li> <li>c) Define inertia constant of synchronous machine.</li> <li>d) Draw electrical analog circuit of hydraulic turbine.</li> <li>e) Classify stability of dynamic system.</li> <li>f) Define reliable power system.</li> </ol> |          |
| Q.2 | <ol style="list-style-type: none"> <li>a) Derive the equations for electrical power and torque in terms of dqo components.</li> <li>b) Explain simplified model of synchronous machine with amortisseurs neglected.</li> </ol>                                                                                                                                                    | 08<br>07 |
| Q.3 | <ol style="list-style-type: none"> <li>a) Explain elements of excitation system with help of functional block diagram.</li> <li>b) Explain classical transfer function of hydraulic turbine with its special characteristics.</li> </ol>                                                                                                                                          | 08<br>07 |
| Q.4 | <ol style="list-style-type: none"> <li>a) Explain the classical model of single machine infinite bus system.</li> <li>b) Explain state space representation in stability of dynamic system.</li> </ol>                                                                                                                                                                            | 08<br>07 |
| Q.5 | Write short note on the following:                                                                                                                                                                                                                                                                                                                                                | 15       |
|     | <ol style="list-style-type: none"> <li>a) Park` s transformation</li> <li>b) Armature and field structure of synchronous machine.</li> <li>c) Requirement for a transient droop in governor for hydraulic turbine.</li> </ol>                                                                                                                                                     |          |

## Section B

- Q.6 Solve any five questions. 10
- What is economic load dispatch
  - What is load frequency control
  - What is synchronous condenser
  - Define long term hydro scheduling problem.
  - What is shunt reactor?
  - What is optimum scheduling of hydrothermal system?
- Q.7
- Explain and derive the expression for long term hydrothermal scheduling. 08
  - A constant load of 300 mw is supplied by two 200mw generators whose incremental fuel costs are given by 07
- $$\frac{dC_1}{dP_{G_1}} = 0.20p_{G_1} + 40$$
- $$\frac{dC_2}{dP_{G_2}} = 0.25P_{G_2} + 30$$
- And
- $$P_{G_{1min}} = 20mw$$
- $$P_{G_{2min}} = 125 mw$$
- With power PG in MW and cost c in RS/hr. determine:
- The most economical division of load between the generators.
  - The saving in Rs/day there by obtained compared to equal load sharing between the generators.
- Q.8
- Explain any four methods of voltage control in details. 08
  - Explain production and absorption of reactive power in system equipment 07
- Q.9
- Explain power system security assessment in details. 08
  - Explain the different power system operating states with the help of schematic diagram and also 07  
Explain evaluation system state by contingency analysis.
- Q10 Write down short note on. 15
- Application of tap changing transformers.
  - Distribution system voltage regulation.
  - Role of SCADA system in energy management system.