



III B.Tech II Sem Regular End Examination, June 2022

Power System Operation and Control
(Electrical and Electronics Engineering)

Time: 3 Hours.

Max. Marks: 70

Note: 1. Question paper consists: Part-A and Part-B.

2. In Part - A, answer all questions which carries 20 marks.

3. In Part - B, answer any one question from each unit.

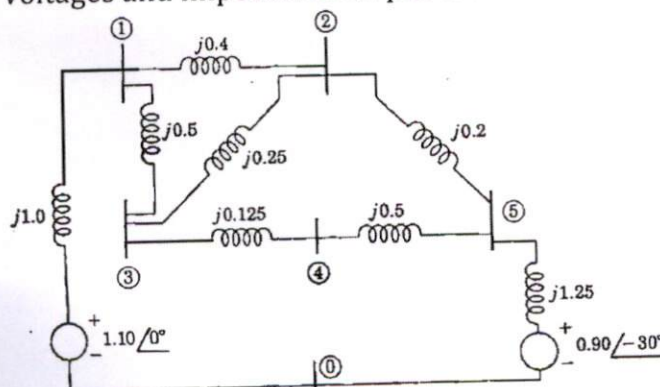
Each question carries 10 marks and may have a, b as sub questions.

PART- A**(10*2 Marks = 20 Marks)**

- | | | | | |
|-------|--|----|-----|----|
| 1. a) | Give the steps for building Y_{bus} using direct inspection method. | 2M | CO1 | BL |
| b) | Why Slack bus need to be defined to carry load flow studies? | 2M | CO1 | BL |
| c) | What is Economical Load Dispatch problem? | 2M | CO2 | BL |
| d) | What is the physical significance of penalty factor? Explain. | 2M | CO2 | BL |
| e) | What is area control error signal? Explain. | 2M | CO3 | BL |
| f) | Why PI is preferred over PD controller in LF control system? | 2M | CO3 | BL |
| g) | For a 200MVA rated generator, if inertia constant H on a system base of 100MVA is 5s. What will be its inertia constant on a new base of 300MVA? | 2M | CO4 | BL |
| h) | What are the limitations of equal area criteria? | 2M | CO4 | BL |
| i) | Distinguish between Energy management Centre and SCADA system. | 2M | CO5 | BL |
| j) | What do you mean by computer control of Power System? | 2M | CO5 | BL |

PART- B**(10*5 Marks = 50 Marks)**

- | | | | | |
|------|--|----|-----|----|
| 2 a) | What is a Load Flow study? Give the classification with respect to application. Explain, how buses are classified and necessity of slack bus? | 5M | CO1 | BL |
| b) | Determine the Y_{BUS} for the system shown in below figure using direct inspection method. Assume there is no mutual coupling between any of the branches. Values shown in the figure are voltages and impedances in per unit. | 5M | CO1 | BL |



- 3 Explain the Gauss Seidel load flow solution method. Also give the logic for PV bus inclusion in the algorithm. 10M C01 BL
- 4 a) Derive the necessary and sufficient conditions for optimal load scheduling without network loss considered. 5M C02 BL
 b) Incremental fuel costs in Rs. per megawatt hour for two units in a plant are given by

$$\frac{dF_1}{dP_1} = 0.1P_1 + 20$$

$$\frac{dF_2}{dP_2} = 0.12P_1 + 16$$

 The minimum and maximum loads on each unit are to be 20 MW and 125 MW respectively. Determine the incremental fuel cost and the allocation of load between units for the minimum cost when load is (i) 100 MW and (ii) 150 MW. Assume both the units are operating. 5M C02 BL
- OR
- 5 Derive the General Transmission Loss Formula as function of Generator Power outputs. 10M C02 BL
- 6 a) Explain, with a neat sketch, the principle of operation of a hydraulic governor and derive its linear block diagram representation from the basic governing equations. 5M C03 BL
 b) What is Tie-Line bias control? Draw the Two-area closed loop controlled load frequency system, mentioning all the signal parameters. 5M C03 BL
- OR
- 7 Perform the steady state analysis on closed loop controlled single area load frequency system and deduce the inferences there from. 10M C03 BL
- 8 a) Define steady state, transient and dynamic stability of a power system. 5M C04 BL
 b) Derive Swing Equation of the machine. 5M C04 BL
- OR
- 9 A synchronous generator is feeding 250 MW to a large 50 Hz network over a double circuit transmission line. The maximum steady state power that can be transmitted over the line with both circuits in operation is 500 MW and is 350 MW with anyone of the circuits. A solid three-phase fault occurring at the network-end of one of the lines causes it to trip. Estimate the critical clearing angle in which the circuit breakers must trip so that synchronism is not lost. What further information is needed to estimate the critical clearing time? 10M C04 BL
- 10 a) Explain the Need of computer control of power systems. 5M C05 BL
 b) Explain the objectives of a Load Dispatch centre and give the various routines performed for system operations. 5M C05 BL
- OR
- 11 Briefly discuss about System hardware configuration requirement for SCADA. 10M C05 BL