

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE- SEMESTER- VII EXAMINATION – SUMMER 2026****Subject Code:3170915****Date:05-06-2026****Subject Name:Power System Dynamics and Control****Time:02:30 PM TO 05:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

**MARKS**

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|------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>Q.1</b> | <b>(a)</b> State assumptions used to apply equal area criterion.                                                                             | <b>03</b> |
|            | <b>(b)</b> Distinguish between steady state, transient state and dynamic stability.                                                          | <b>04</b> |
|            | <b>(c)</b> Explain different operating states of a typical power system network with help of neat diagram.                                   | <b>07</b> |
| <b>Q.2</b> | <b>(a)</b> Define power system stabilizer.                                                                                                   | <b>03</b> |
|            | <b>(b)</b> Explain in the types of load models used in power system analysis.                                                                | <b>04</b> |
|            | <b>(c)</b> Draw general functional block diagram of an excitation control system and explain the function of each block.                     | <b>07</b> |
| <b>OR</b>  |                                                                                                                                              |           |
| <b>Q.2</b> | <b>(c)</b> Describe briefly the per unit representation of Load-reciprocal per unit system                                                   | <b>07</b> |
| <b>Q.3</b> | <b>(a)</b> What are the assumptions made in developing the mathematical model of a synchronous machine?                                      | <b>03</b> |
|            | <b>(b)</b> Write down the voltage equation for rotor in dq0 coordinates.                                                                     | <b>04</b> |
|            | <b>(c)</b> Explain the two axis model of the synchronous machine with amortisseur windings neglected.                                        | <b>07</b> |
| <b>OR</b>  |                                                                                                                                              |           |
| <b>Q.3</b> | <b>(a)</b> Explain the effect of neglecting transformer emf in stator voltage equations.                                                     | <b>03</b> |
|            | <b>(b)</b> Write down the voltage equation for stator in dq0 coordinates.                                                                    | <b>04</b> |
|            | <b>(c)</b> Explain power invariant form of park's transformation.                                                                            | <b>07</b> |
| <b>Q.4</b> | <b>(a)</b> What are the requirements in transient droops?                                                                                    | <b>03</b> |
|            | <b>(b)</b> Prepare the list of elements of an excitation systems.                                                                            | <b>04</b> |
|            | <b>(c)</b> Explain the mathematical modeling of governor for hydraulic turbine.                                                              | <b>07</b> |
| <b>OR</b>  |                                                                                                                                              |           |
| <b>Q.4</b> | <b>(a)</b> What is meant by speed governing system?                                                                                          | <b>03</b> |
|            | <b>(b)</b> Discuss the role of governor in hydraulic turbine?                                                                                | <b>04</b> |
|            | <b>(c)</b> Discuss the elements of excitation system in detail. Also explain the various control and protective scheme of excitation system. | <b>07</b> |
| <b>Q.5</b> | <b>(a)</b> Explain application of Model 1.1.                                                                                                 | <b>03</b> |
|            | <b>(b)</b> Discuss with reasons: Load are modelled as constant impedance in stability studies.                                               | <b>04</b> |
|            | <b>(c)</b> What is voltage stability? Explain with neat diagrams.                                                                            | <b>07</b> |
| <b>OR</b>  |                                                                                                                                              |           |
| <b>Q.5</b> | <b>(a)</b> Why load is consider as a constant impedance model?                                                                               | <b>03</b> |
|            | <b>(b)</b> Describe the steps for calculating initial conditions of a synchronous generator.                                                 | <b>04</b> |
|            | <b>(c)</b> Briefly explain : Discrete Control of HVDC Links.                                                                                 | <b>07</b> |

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