Power System Operation and Control (315336)

MSBTE Diploma · K-Scheme · Electrical Engineering (EE / EP), Semester 5 · Important Questions

How this list was made: Based on MSBTE papers **W-2025 and S-2026** available on msbte.ac.in — these are the **only two** K-scheme papers of this course so far, so the analysis is based on a small sample. Every question of both papers (52 in all) was grouped by topic. **High** = asked in both papers, **Medium** = asked in one paper, **Low** = in the K-scheme syllabus but not asked yet. Practice guidance only — not a prediction of the exam.

Syllabus marks weightage (suggested by MSBTE): Unit I – 12, Unit II – 20, Unit III – 12, Unit IV – 14, Unit V – 12 (total 70). Unit II (real and reactive power flow, compensation, FACTS) carries the most marks.

Topics asked in both papers

#	Topic	Unit	Times asked
1	Stability terms – power system stability, instability, overall, steady state, transient, dynamic stability	4	4 (S-26, W-25)
2	Automatic generation control (AGC) – block diagram / components	3	3 (S-26, W-25)
3	Automatic voltage control (AVC / AVR) – schematic / block diagram	3	3 (S-26, W-25)
4	Types of load dispatch centres in India (NLDC, RLDC, SLDC) – locations and functions	5	3 (S-26, W-25)
5	Need / significance of load forecasting	5	3 (S-26, W-25)
6	Per unit value / per unit impedance – definition (base quantities)	1	2 (S-26, W-25)
7	Per unit reactance diagram – numerical from a given single line diagram	1	2 (S-26, W-25)
8	Structure / main components of power system; single line diagram	1	2 (S-26, W-25)
9	Relation between real power balance and frequency	2	2 (S-26, W-25)
10	Impact of frequency variation on consumers / supply agencies; need of constant frequency	2	2 (S-26, W-25)
11	Relation between reactive power balance and voltage (V–Q derivation, two-bus system)	2	2 (S-26, W-25)
12	Impact of voltage variation on consumers and supply agencies; need of constant voltage	2	2 (S-26, W-25)
13	Shunt and series compensation of transmission line	2	2 (S-26, W-25)
14	FACTS devices for reactive power injection – STATCOM, SSSC, UPFC, IPFC	2	2 (S-26, W-25)
15	Automatic load frequency control (ALFC) – function / block diagram	3	2 (S-26, W-25)
16	Turbine speed governing system (schematic)	3	2 (S-26, W-25)
17	Large disturbance vs small disturbance	4	2 (S-26, W-25)
18	Methods of improving transient stability	4	2 (S-26, W-25)
19	Functions of load dispatch centre / NLDC	5	2 (S-26, W-25)

20	Environmental and social factors in load forecasting	5	2 (S-26, W-25)

Unit I – Representation of Power System (12 marks)

Question / topic	Marks	Asked in	Probability
Per unit value / per unit impedance – definition (base quantities) • Define the term per unit impedance. *(W-25 Q.1c, 2 M)* • Define per unit value. *(S-26 Q.1c, 2 M)*	2 M	S-26, W-25	**High**
Per unit reactance diagram – numerical from a given single line diagram • Draw the per unit reactance diagram for the system shown (generator as base, 11 kV, 100 MVA). *(W-25 Q.3b, 4 M)* • Draw per unit diagram for given power system assuming transformer as base. *(S-26 Q.6a, 6 M)*	4 M, 6 M	S-26, W-25	**High**
Structure / main components of power system; single line diagram • Draw and explain a single line diagram of a power system. *(W-25 Q.2a, 4 M)* • State the main components of power system. (Any four points) *(S-26 Q.1a, 2 M)*	2 M, 4 M	S-26, W-25	**High**
Reactance diagram / impedance diagram – definition and drawing • Define reactance diagram. *(W-25 Q.1a, 2 M)*	2 M	W-25	**Medium**
Advantages of per unit system • Explain any six advantages of using the per unit system in power system analysis. *(W-25 Q.5a, 6 M)*	6 M	W-25	**Medium**
Requirements of stable power system operation In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	**Low**

Unit II – Real and Reactive Power Flow (20 marks)

Question / topic	Marks	Asked in	Probability
Relation between real power balance and frequency • Explain the relation between real power flow and frequency. *(W-25 Q.3c, 4 M)* • Derive relation between real power balance and frequency of the power system. *(S-26 Q.3b, 4 M)*	4 M	S-26, W-25	**High**
Impact of frequency variation on consumers / supply agencies; need of constant frequency • State any two adverse impacts of frequency variations on supply agencies. *(W-25 Q.1b, 2 M)* • State the need of constant frequency control. *(S-26 Q.1d, 2 M)*	2 M	S-26, W-25	**High**

Relation between reactive power balance and voltage (V–Q derivation, two-bus system) • Explain the relation between reactive power balance and voltage of system. *(W-25 Q.5c, 6 M)* • Derive the relation between voltage and reactive power flow in simple two power system. *(S-26 Q.5a, 6 M)*	6 M	S-26, W-25	**High**
Impact of voltage variation on consumers and supply agencies; need of constant voltage • Explain the impact of variation in voltage on consumers and supply agencies (generation plants). *(W-25 Q.4c, 4 M)* • Explain the need of constant supply voltage for consumers. *(S-26 Q.2a, 4 M)*	4 M	S-26, W-25	**High**
Shunt and series compensation of transmission line • Explain the shunt compensation and series compensation method of reactive power compensation for transmission line. *(W-25 Q.5b, 6 M)* • Explain shunt compensation and series compensation method of reactive power compensation for transmission line. *(S-26 Q.5c, 6 M)*	6 M	S-26, W-25	**High**
FACTS devices for reactive power injection – STATCOM, SSSC, UPFC, IPFC • With the help of a neat diagram, explain the working principle of a STATCOM. *(W-25 Q.2d, 4 M)* • Explain any two FACT devices used for reactive power injection. *(S-26 Q.4b, 4 M)*	4 M	S-26, W-25	**High**
Effects of reactive power imbalance • List out effect of reactive power imbalance in power system. *(S-26 Q.1b, 2 M)*	2 M	S-26	**Medium**
Reactive power compensation – concept and compensating equipment • State the concept of reactive power compensation. Name any two reactive power compensating equipments. *(W-25 Q.2b, 4 M)*	4 M	W-25	**Medium**
Need of FACTS controllers In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	**Low**

Unit III – Automatic Generation Control (12 marks)

Question / topic	Marks	Asked in	Probability
Automatic generation control (AGC) – block diagram / components • Mention any two components used in AGC loop. *(W-25 Q.1d, 2 M)* • Draw the block diagram of Automatic Generation Control (AGC) for generating system. *(W-25 Q.2c, 4 M)* • Draw the block diagram of automatic generation control (AGC) for generating system. *(S-26 Q.2b, 4 M)*	2 M, 4 M	S-26, W-25	**High**

Automatic voltage control (AVC / AVR) – schematic / block diagram • Draw a labelled schematic diagram of Automatic Voltage Control (AVC) used for an alternator. *(W-25 Q.4a, 4 M)* • Draw a labelled schematic diagram of Automatic Voltage Control (AVC). *(S-26 Q.3a, 4 M)* • Describe the functioning of Automatic Voltage Control (AVR) with neat block diagram. *(S-26 Q.6b, 6 M)*	4 M, 6 M	S-26, W-25	**High**
Automatic load frequency control (ALFC) – function / block diagram • State the function of (ALFC) Automatic load frequency control. *(W-25 Q.1e, 2 M)* • Explain the block diagram of (ALFC) automatic load frequency control. *(S-26 Q.4c, 4 M)*	2 M, 4 M	S-26, W-25	**High**
Turbine speed governing system (schematic) • Describe the working of turbine speed governing system for turbo generator speed control with a labelled schematic diagram. *(W-25 Q.6a, 6 M)* • Describe the working of Turbine speed Governing system for turbo generator speed control with a labelled schematic diagram. *(S-26 Q.5b, 6 M)*	6 M	S-26, W-25	**High**
Electro-hydraulic (digital) governor; RGMO and FGMO In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	**Low**

Unit IV – Power System Stability (14 marks)

Question / topic	Marks	Asked in	Probability
Stability terms – power system stability, instability, overall, steady state, transient, dynamic stability • Define Dynamic stability. (first part; second part listed under methods to improve dynamic stability) *(W-25 Q.4d, 4 M)* • i) Define power system stability and instability. *(W-25 Q.6c, 6 M)* • Define: i) Dynamic stability ii) Transient stability. *(S-26 Q.1e, 2 M)* • Define: Instability, Power system stability, Overall stability, Steady state stability. *(S-26 Q.4a, 4 M)*	2 M, 4 M, 6 M	S-26, W-25	**High**
Large disturbance vs small disturbance • Differentiate large disturbance and small disturbance in power system. (Any two points) *(W-25 Q.1f, 2 M)* • Compare between small disturbance and large disturbance in a power system. (Write any two point) *(S-26 Q.1g, 2 M)*	2 M	S-26, W-25	**High**
Methods of improving transient stability • Explain any two methods that can be adopted for the improvement of transient stability condition of power system. *(W-25 Q.3d, 4 M)*	4 M, 6 M	S-26, W-25	**High**

• Describe various methods of improving transient state stability condition. *(S-26 Q.6c, 6 M)*			
Steady state stability with power angle diagram • Explain steady state stability conditions with the help of power angle diagram for the power system. *(W-25 Q.6b, 6 M)*	6 M	W-25	**Medium**
Steady state vs transient stability – difference • ii) State the difference between steady state stability and transient state stability. *(W-25 Q.6c, 6 M)*	6 M	W-25	**Medium**
Methods of improving steady state / dynamic stability • State any two methods to improve dynamic stability limit. *(W-25 Q.4d, 4 M)*	4 M	W-25	**Medium**
Effects (adverse effects) of power system instability • State the adverse effect of instability of power system. *(S-26 Q.2d, 4 M)*	4 M	S-26	**Medium**

Unit V – Load Dispatch Centre (12 marks)

Question / topic	Marks	Asked in	Probability
Types of load dispatch centres in India (NLDC, RLDC, SLDC) – locations and functions • Name the different types of load Dispatch Centres in India. *(W-25 Q.1g, 2 M)* • With reference to Indian power system, state the types of LDCs and their functions. *(S-26 Q.3c, 4 M)* • State the types of Load Dispatch Centre (LDC) and their locations w.r.t. Indian Power System. *(S-26 Q.4e, 4 M)*	2 M, 4 M	S-26, W-25	**High**
Need / significance of load forecasting • Explain need of load forecasting in power systems operation. *(W-25 Q.4e, 4 M)* • State the significance of load forecasting in power system. *(S-26 Q.1f, 2 M)* • Describe the need of load forecasting in power system operation. *(S-26 Q.2c, 4 M)*	2 M, 4 M	S-26, W-25	**High**
Functions of load dispatch centre / NLDC • State any four major functions of load dispatch center. *(W-25 Q.3a, 4 M)* • List out the function of National load dispatch centre. *(S-26 Q.3d, 4 M)*	4 M	S-26, W-25	**High**
Environmental and social factors in load forecasting • State the impact of Environmental factor on load forecasting. *(W-25 Q.4b, 4 M)* • Explain environmental and social factors in load forecasting. *(S-26 Q.4d, 4 M)*	4 M	S-26, W-25	**High**

Need and importance of load dispatch centre; role of SCADA In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	**Low**

Exam tips from the two papers

- Paper pattern: Q.1 any FIVE of 7 (2 M each); Q.2 and Q.3 any THREE of 4, Q.4 any THREE of 5 (4 M each); Q.5 and Q.6 any TWO of 3 (6 M each); 3 hours, 70 marks. A non-programmable calculator is allowed.
- **Stability definitions** came 4 times (2 M, 4 M and 6 M) — learn exact one-line definitions of power system stability, instability, stability limit, overall, steady state, transient and dynamic stability.
- **Block / schematic diagrams** come in every paper: AGC, ALFC, AVC/AVR and the turbine speed governing system. Practise drawing each one neatly in 5 minutes with all labels.
- **Per-unit reactance diagram** numerical was asked in both papers (4 M and 6 M). Learn the change-of-base formula and Z_{base} = kV²/MVA; show base kV of each zone.
- Unit II derivations: real power balance – frequency and reactive power balance – voltage (V–Q relation of a two-bus system) were asked in both papers.
- Shunt and series compensation (6 M) came in both papers with the same wording; STATCOM / FACTS devices were asked in both papers.
- Load dispatch centres: types (NLDC, RLDC, SLDC) with locations and functions, and load forecasting (need, environmental and social factors) are short, scoring answers.

Note: This is a **important-question list prepared by Ananda Technologies** only for practice and exam preparation, based on the pattern of previous MSBTE question papers and the K-scheme syllabus. It is **not an official MSBTE paper**, and it does **not** mean that these questions will come in the exam. Answers follow standard textbook points; marks shown are indicative. Free for students — anandatechnologies.in