

A.C. Machines Performance (315333)

MSBTE Diploma · K-Scheme · Electrical Engineering (EE), 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 “High” simply means it was asked in both of them). Every question of both papers was grouped by topic; units and unit marks are from the K-scheme curriculum specification table. **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.

Most repeated topics

#	Topic	Unit	Times asked
1	Shaded pole motor – starting technique, T–N characteristic, applications	3	3 (W-25, S-26)
2	Slip and synchronous speed – definition / factors affecting slip	1	2 (W-25, S-26)
3	Rotating magnetic field (RMF) – concept / production with phasor diagram	1	2 (W-25, S-26)
4	Power stages / power flow diagram of 3- ϕ induction motor	1	2 (W-25, S-26)
5	Numerical on power stages – slip, rotor input, rotor Cu loss, efficiency, rotor frequency	1	2 (W-25, S-26)
6	Numerical on torque – starting, full load, maximum torque and their ratios	1	2 (W-25, S-26)
7	Methods of slip measurement (tachometer, stroboscopic, galvanometer)	1	2 (W-25, S-26)
8	Star–delta starter – diagram and working	2	2 (W-25, S-26)
9	Soft starter – working / advantages	2	2 (W-25, S-26)
10	Double field revolving theory	3	2 (W-25, S-26)
11	Capacitor start capacitor run (two-value) motor	3	2 (W-25, S-26)
12	Armature reaction at various power factors	4	2 (W-25, S-26)

Unit I – Three Phase Induction Motors (20 M)

Question / topic	Marks	Asked in	Probability
Slip and synchronous speed – definition / factors affecting slip • Define slip and synchronous speed of 3 ϕ induction motor. (W-25 Q.1a) • State any two factors affecting the slip of 3 ϕ induction motor. (S-26 Q.1a)	2 M	W-25, S-26	High
Rotating magnetic field (RMF) – concept / production with phasor diagram • Explain the concept of rotating magnetic field in 3-phase induction motor. (W-25 Q.4a)	4 M, 6 M	W-25, S-26	High

<ul style="list-style-type: none"> Illustrate the production of rotating magnetic field in three phase induction motor using suitable phasor diagram. (S-26 Q.5b) 			
Power stages / power flow diagram of 3-ϕ induction motor <ul style="list-style-type: none"> Explain in detail the power stages in induction motor (power flow diagram). (W-25 Q.5c) Draw and label different power stages in three phase induction motor. (S-26 Q.6c(i)) 	3 M, 6 M	W-25, S-26	High
Numerical on power stages – slip, rotor input, rotor Cu loss, efficiency, rotor frequency <ul style="list-style-type: none"> 6 pole, 50 Hz IM, input 42 kW, 970 rpm, stator losses 1.2 kW, F&W 1.8 kW: slip, rotor output, rotor Cu loss, efficiency. (W-25 Q.4b) Rotor input 80 kW, rotor emf makes 100 alternations/min: slip, rotor speed, rotor Cu loss. (S-26 Q.6c(ii)) 	3 M, 4 M	W-25, S-26	High
Numerical on torque – starting, full load, maximum torque and their ratios <ul style="list-style-type: none"> 12 pole 50 Hz IM, $R_2 = 0.15 \Omega$, $X_2 = 0.25 \Omega$, 480 rpm, $E_2 = 32$ V: starting, full load and maximum torque. (W-25 Q.5b) Derive ratio of full load torque to maximum torque; numerical on T_{max}/T_{fl} and speed at maximum torque. (S-26 Q.6a) 	6 M	W-25, S-26	High
Methods of slip measurement (tachometer, stroboscopic, galvanometer) <ul style="list-style-type: none"> List methods of measurement of slip. Describe how slip is measured by each method. (W-25 Q.6a) Describe stepwise procedure of stroboscopic method used for slip measurement. (S-26 Q.4a) 	4 M, 6 M	W-25, S-26	High
Torque–slip characteristics of 3-ϕ induction motor <ul style="list-style-type: none"> Draw and explain torque-slip characteristics of three phase induction motor. (S-26 Q.4b) 	4 M	S-26	Medium
Rotor power factor at standstill and running <ul style="list-style-type: none"> Write the equation of rotor power factor at standstill and under running condition. (S-26 Q.1b) 	2 M	S-26	Medium
Functions of parts of stator and rotor <ul style="list-style-type: none"> State the function of following parts in induction motor stator and rotor. (W-25 Q.1b) 	2 M	W-25	Medium
Construction of squirrel cage and slip ring motors – comparison In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	Low
Rotor frequency, rotor emf and rotor current under running condition In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	Low

Unit II – Starting and Speed Control of 3- ϕ Induction Motors (10 M)

Question / topic	Marks	Asked in	Probability
Star–delta starter – diagram and working <ul style="list-style-type: none"> • Draw neat diagram of star-delta starter for 3-ϕ induction motor. (W-25 Q.2b) • Describe the working of star delta starter with neat sketch. (S-26 Q.2a) 	4 M	W-25, S-26	High
Soft starter – working / advantages <ul style="list-style-type: none"> • Explain working of the soft starter with neat diagram. (W-25 Q.2a) • State any two advantages of soft starter over a conventional starter. (S-26 Q.1c) 	2 M, 4 M	W-25, S-26	High
Necessity of starter and types of starters <ul style="list-style-type: none"> • State the necessity of starter for 3-ϕ induction motor and list types of starter. (W-25 Q.2c) 	4 M	W-25	Medium
Variable frequency drive (VFD) – block diagram <ul style="list-style-type: none"> • Draw a block diagram of a variable frequency drive and explain the function of each block. (S-26 Q.2b) 	4 M	S-26	Medium
Numerical on starting current – DOL, star–delta, auto-transformer <ul style="list-style-type: none"> • Delta motor, 400 V, starting current 100 A per phase: line current for DOL, star-delta, 70 % auto-transformer tapping. (S-26 Q.2c) 	4 M	S-26	Medium
Auto-transformer / DOL / rotor resistance starter In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	Low
Speed control – stator voltage, pole changing, rotor resistance In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	Low

Unit III – Single Phase Induction Motors (14 M)

Question / topic	Marks	Asked in	Probability
Shaded pole motor – starting technique, T–N characteristic, applications <ul style="list-style-type: none"> • State any four applications of shaded pole induction motor. (W-25 Q.1c) • Draw torque speed characteristics of shaded pole motor. (S-26 Q.1d) • Explain shaded pole self starting technique used in single phase induction motor. (S-26 Q.3b) 	2 M, 4 M	W-25, S-26	High
Double field revolving theory <ul style="list-style-type: none"> • Explain double field revolving theory of single phase induction motor. (W-25 Q.3b) • Explain with neat sketch double field revolving theory in single phase induction motor. (S-26 Q.3a) 	4 M	W-25, S-26	High

Capacitor start capacitor run (two-value) motor <ul style="list-style-type: none"> Explain with neat diagram working of capacitor start capacitor run induction motor. (W-25 Q.2d) Describe with neat sketch the working of capacitor start capacitor run (two value) motor. (S-26 Q.3c) 	4 M	W-25, S-26	High
Resistance split-phase motor – working, phasor diagram, T–N characteristic <ul style="list-style-type: none"> Explain working of resistance split phase 1ϕ induction motor with vector diagram. (W-25 Q.3a) Draw and explain working of resistance split phase motor; draw its torque-speed characteristics. (W-25 Q.4e) 	4 M	W-25	Medium
Types of 1-ϕ induction motors / selection for applications <ul style="list-style-type: none"> List the types of single phase induction motor. (W-25 Q.1d) Suggest type of 1-ϕ IM for washing machine, refrigerator, petrol pumps, recording instruments. (W-25 Q.3d) 	2 M, 4 M	W-25	Medium
Capacitor start induction run motor – construction <ul style="list-style-type: none"> Explain with neat sketch the construction of capacitor start induction run motor. (S-26 Q.2d) 	4 M	S-26	Medium
Comparison: capacitor start vs capacitor start capacitor run <ul style="list-style-type: none"> Compare between capacitor start and capacitor start capacitor run induction motor. (W-25 Q.3c) 	4 M	W-25	Medium
Numerical – capacitance for maximum starting torque <ul style="list-style-type: none"> Main winding (5.2 + j10.1) Ω, auxiliary (19.7 + j14.2) Ω, 200 V 50 Hz: capacitance for maximum starting torque. (S-26 Q.3d) 	4 M	S-26	Medium
Need of 1-ϕ IM; reluctance start technique In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	Low

Unit IV – Three Phase Synchronous Machines (16 M)

Question / topic	Marks	Asked in	Probability
Armature reaction at various power factors <ul style="list-style-type: none"> Explain armature reaction at various power factors of the load on an alternator with waveforms. (W-25 Q.6c) What is armature reaction in an alternator? Explain its effect at various p.f. of loads. (S-26 Q.5c) 	6 M	W-25, S-26	High
EMF equation of alternator and numerical (with pitch / distribution factor) <ul style="list-style-type: none"> 8 pole alternator, 120 slots, 8 conductors/slot, 0.05 Wb, full pitch: phase and line voltage. (W-25 Q.6b) Derive EMF equation; 6 pole, 1200 rpm, 54 slots, double layer, 8 turns/coil, chorded by 1 slot: phase and line voltage. (S-26 Q.5a) 	6 M	W-25, S-26	High

Voltage regulation numerical – synchronous impedance (EMF) method <ul style="list-style-type: none"> 1600 kVA, 13500 V star alternator, R_a 1.5 Ω, X_s 30 Ω: % regulation at 0.8 leading and unity p.f. (W-25 Q.5a) 2000 V 1-ϕ alternator, OC/SC test data, R_a 0.8 Ω: regulation at unity, 0.8 lead and 0.8 lag. (S-26 Q.6b) 	6 M	W-25, S-26	High
Synchronous motor torques – pull-in, pull-out, starting, running <ul style="list-style-type: none"> List different types of torques in synchronous motor. (W-25 Q.1f) Define pull-in torque and pull-out torque in case of synchronous motor. (S-26 Q.1e) 	2 M	W-25, S-26	High
Pitch factor and distribution factor – definitions <ul style="list-style-type: none"> Define pitch factor and distribution factor. (W-25 Q.1e) 	2 M	W-25	Medium
Factors affecting voltage regulation of alternator <ul style="list-style-type: none"> State the factors affecting the voltage regulation of alternator. (S-26 Q.1f) 	2 M	S-26	Medium
Turbo vs hydro alternator; rotating field; excitation systems In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	Low
Synchronisation – necessity and conditions In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	Low
Synchronous motor – principle, load angle, V-curves, p.f. improvement In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	Low

Unit V – Special Purpose Machines (10 M)

Question / topic	Marks	Asked in	Probability
Stepper motor – applications <ul style="list-style-type: none"> List application of stepper motor. (W-25 Q.1g) List the applications of stepper motor. (S-26 Q.1g) 	2 M	W-25, S-26	High
Stepper motor – construction, working and step angle numerical <ul style="list-style-type: none"> Explain the construction and working of permanent magnet stepper motor. (W-25 Q.4c) Single-stack, 8 phase stepper, 6 rotor teeth, 120 Hz: step size, steps/rev, speed. (S-26 Q.4e) 	4 M	W-25, S-26	High
Universal motor – construction and torque–speed characteristic <ul style="list-style-type: none"> Explain the construction of universal motor and draw its torque-speed characteristics. (W-25 Q.4d) 	4 M	W-25	Medium
Synchronous reluctance motor – construction <ul style="list-style-type: none"> Explain with neat sketch the construction of synchronous reluctance 	4 M	S-26	Medium

motor. (S-26 Q.4c)			
Linear induction motor – single sided vs double sided • Compare single sided and double sided LIM: primary winding, flux path, efficiency, p.f. (S-26 Q.4d)	4 M	S-26	Medium
Permanent magnet synchronous motor (PMSM) In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	Low

Exam tips from the two papers

- Both papers had **four or more numericals**: induction motor power stages (slip, rotor Cu loss, efficiency), torque (starting / full-load / maximum), alternator EMF with pitch and distribution factor, and voltage regulation by synchronous impedance method. Learn the formula sheet and practise with new values.
- Star–delta starter, soft starter, double field revolving theory, capacitor-start-capacitor-run motor and armature reaction** came in both papers — learn the diagram for each.
- Q.1 in both papers asked **applications of stepper motor** and a synchronous-motor torque question (types / pull-in / pull-out).
- Diagrams expected: power flow diagram, T–s curve, RMF phasors, starter circuits, VFD block diagram, 1- ϕ motor circuits with phasor diagrams, armature reaction phasors, stepper motor construction.

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