

Theory of Structure (315313)

MSBTE Diploma · K-Scheme · Civil Engineering (CE), 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 the topic was asked in both papers). All 52 sub-questions of the two papers were grouped by topic; units and unit marks are from the K-scheme curriculum. **High** = asked in both papers, **Medium** = asked in one paper, **Low** = in the syllabus but not asked yet. Practice guidance only — not a prediction of the exam.

Most repeated topics

#	Topic	Unit	Times asked
1	Cantilever – slope and deflection (standard formulae / Macaulay’s method)	1	3 (W-25, S-26)
2	Three-moment numerical – continuous beam simply supported at ends (support moments, SFD, BMD)	3	3 (W-25, S-26)
3	Moment distribution numerical – continuous beam (support moments, BMD)	4	3 (W-25, S-26)
4	Define slope and deflection of a beam (with sketch)	1	2 (W-25, S-26)
5	Relationship between bending moment, slope and deflection	1	2 (W-25, S-26)
6	SS beam with UDL – maximum slope and deflection by standard formulae	1	2 (W-25, S-26)
7	SS beam by Macaulay’s method – deflection under load / maximum deflection	1	2 (W-25, S-26)
8	Define fixed beam	2	2 (W-25, S-26)
9	Advantages and disadvantages of fixed beam over SS beam	2	2 (W-25, S-26)
10	Fixed beam with point loads – fixed end moments and BMD (figure)	2	2 (W-25, S-26)
11	Fixed beam with UDL ($\pm$ point load) – FEM (first principles) and BMD	2	2 (W-25, S-26)
12	Clapeyron’s theorem of three moments – statement and explanation	3	2 (W-25, S-26)

Unit I – Slope and Deflection (14 M)

Question / topic	Marks	Asked in	Probability
Cantilever – slope and deflection (standard formulae / Macaulay’s method) <ul style="list-style-type: none"> Cantilever 2.5 m, UDL 10 kN/m, section 100 × 300 mm; slope and deflection at free end. (W-25 Q.2b) Cantilever 3 m, UDL 3 kN/m + 4 kN at 2 m from free end; slope and deflection under the load (Macaulay). (W-25 Q.2d) Cantilever 2 m, udl 10 kN/m over 1 m from fixed end + 20 kN at free end; maximum slope and deflection. (S-26 Q.5c) 	4 M, 6 M	W-25, S-26	High

Define slope and deflection of a beam (with sketch) <ul style="list-style-type: none"> Define slope and deflection of beam with neat sketch. (W-25 Q.1a) Define slope and deflection of a beam. (S-26 Q.1g) 	2 M	W-25, S-26	High
Relationship between bending moment, slope and deflection <ul style="list-style-type: none"> Give relationship between bending moment, slope and deflection. (W-25 Q.1b) State the expression for relationship between bending moment, slope and deflection. (S-26 Q.1a) 	2 M	W-25, S-26	High
SS beam with UDL – maximum slope and deflection by standard formulae <ul style="list-style-type: none"> Using standard formulae calculate maximum slope and deflection in terms of EI of a SS beam (4 m, 5 kN/m). (W-25 Q.2a) A SS beam carries udl of 5 kN/m over entire span. Find maximum slope and maximum deflection (E, I given). (S-26 Q.2a) 	4 M	W-25, S-26	High
SS beam by Macaulay's method – deflection under load / maximum deflection <ul style="list-style-type: none"> SS beam 6 m, UDL 20 kN/m + 45 kN at 2 m; locate point of maximum deflection and find its value (Macaulay). (W-25 Q.2c) Deflection under point load of SS beam (Fig.), EI constant, Macaulay's method. (S-26 Q.4e) 	4 M	W-25, S-26	High
Boundary conditions for SS, cantilever and fixed beams <ul style="list-style-type: none"> What are the boundary conditions for simply supported, cantilever and fixed beams. (S-26 Q.2b) 	4 M	S-26	Medium
Radius of curvature, stiffness of beam, elastic curve sketch <ul style="list-style-type: none"> Explain radius of curvature and stiffness of beam. Draw elastic curve for central point load. (S-26 Q.5b) 	6 M	S-26	Medium
Double integration method; flexural rigidity In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	Low

Unit II – Fixed Beam (10 M)

Question / topic	Marks	Asked in	Probability
Define fixed beam <ul style="list-style-type: none"> Define fixed beam. (W-25 Q.1c) Define fixed Beam. (S-26 Q.1c) 	2 M	W-25, S-26	High
Advantages and disadvantages of fixed beam over SS beam <ul style="list-style-type: none"> State any two advantages and disadvantages of fixed beam over S.S. beam. (W-25 Q.1d) State advantages and disadvantages of fixed beam over simply supported beam. (S-26 Q.3b) 	2 M, 4 M	W-25, S-26	High

Fixed beam with point loads – fixed end moments and BMD (figure) <ul style="list-style-type: none"> Calculate fixed end moment and draw BMD for fixed beam (30 kN, 20 kN at third points of 9 m). (W-25 Q.3b) Calculate fixed end moment for the fixed beam shown in Fig. (S-26 Q.4b) 	4 M	W-25, S-26	High
Fixed beam with UDL ($\pm$ point load) – FEM (first principles) and BMD <ul style="list-style-type: none"> Fixed beam 8 m, udl 1 kN/m + 6 kN at 3 m; FEM and BMD. (W-25 Q.3c) Fixed beam 6 m, udl 20 kN/m; fixed end moment from first principle and BMD. (S-26 Q.2c) 	4 M	W-25, S-26	High
Principle of superposition with example <ul style="list-style-type: none"> Explain the principle of super position with an example. (W-25 Q.3a) 	4 M	W-25	Medium
Points of contraflexure and contrashear In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	Low

Unit III – Continuous Beam (16 M)

Question / topic	Marks	Asked in	Probability
Three-moment numerical – continuous beam simply supported at ends (support moments, SFD, BMD) <ul style="list-style-type: none"> BMD for continuous beam ABC (Fig.); BM at B by three moments. (W-25 Q.4a) Beam ABC, 6 m + 4 m, $I_{AB} = 2 I_{BC}$, 100 kN central + 25 kN/m; SFD and BMD by three moments. (W-25 Q.5b) Support moments of continuous beam, AB 4 m (75 kN), BC 5 m (25 kN/m); three moment theorem. (S-26 Q.2d) 	4 M, 6 M	W-25, S-26	High
Clapeyron's theorem of three moments – statement and explanation <ul style="list-style-type: none"> State and explain Clapeyron's theorem of three moments. (W-25 Q.3d) State and explain Clapeyron's theorem of moments. (S-26 Q.3a) 	4 M	W-25, S-26	High
Three-moment numerical with a fixed end (imaginary span) <ul style="list-style-type: none"> Continuous beam ABC fixed at A (Fig.); support moments by three moments, BMD and SFD. (W-25 Q.5a) Beam ABC fixed at A, AB 6 m, BC 5 m with 45 kN/m; support moments by Clapeyron's theorem and BMD. (S-26 Q.5a) 	6 M	W-25, S-26	High
Effect of continuity on a continuous beam <ul style="list-style-type: none"> State the effect of continuity on a continuous beam. (W-25 Q.1e) 	2 M	W-25	Medium
Concept of imaginary (zero) span <ul style="list-style-type: none"> Explain the concept of imaginary span. (S-26 Q.4c) 	4 M	S-26	Medium

Unit IV – Moment Distribution Method (18 M)

Question / topic	Marks	Asked in	Probability
Moment distribution numerical – continuous beam (support moments, BMD) <ul style="list-style-type: none"> Beam (Fig.) fixed at A, 40 kN + 20 kN/m; support moments and BMD by MDM. (W-25 Q.5c) Beam fixed at A, SS at B, C; AB 6 m 40 kN/m, BC 8 m 80 kN central; MDM and BMD. (W-25 Q.6a) Continuous beam ABC 10 m (Fig.); support moments and BMD by MDM. (S-26 Q.4d) 	4 M, 6 M	W-25, S-26	High
Definitions – stiffness factor, distribution factor, carry-over factor/moment <ul style="list-style-type: none"> Define stiffness factor and distribution factor. (W-25 Q.1f) Define carry over moment and stiffness factor. (S-26 Q.1d) 	2 M	W-25, S-26	High
Distribution factors for beam ABCD (different M.I.) <ul style="list-style-type: none"> Beam ABCD, SS at A and D; AB = BC = CD = 6 m, I, 2I, 1.5I; distribution factors. (W-25 Q.4b) Same beam ABCD (6 m spans, I, 2I, 1.5I); determine distribution factors. (S-26 Q.3c) 	4 M	W-25, S-26	High
Portal frames – symmetrical vs unsymmetrical / sketch of multi-storey frame <ul style="list-style-type: none"> Differentiate between symmetrical and unsymmetrical portal frame with neat sketches. (W-25 Q.4d) Draw a sketch of portal frame symmetrical and having one bay and three storey. (S-26 Q.1f) 	2 M, 4 M	W-25, S-26	High
Distribution factors at a rigid joint with several members <ul style="list-style-type: none"> Distribution factors for members OP, OQ, OR at joint O (Fig.). (W-25 Q.4c) 	4 M	W-25	Medium
Procedure of moment distribution method <ul style="list-style-type: none"> Explain the procedure of moment distribution method. (S-26 Q.6c) 	6 M	S-26	Medium
Sign convention in moment distribution In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	Low

Unit V – Simple Trusses (12 M)

Question / topic	Marks	Asked in	Probability
Define perfect (and imperfect) frame <ul style="list-style-type: none"> Define perfect frame with neat sketch. (W-25 Q.1g) Define perfect and imperfect frame. (S-26 Q.1b) 	2 M	W-25, S-26	High
Truss by method of joints – member forces and reactions <ul style="list-style-type: none"> Nature and magnitude of forces in AB, BC, FD, CF of frame (Fig.) and reactions, method of joints. (W-25 Q.6b) 	6 M	W-25, S-26	High

<ul style="list-style-type: none"> Forces in members AB, AD, DE (cantilever truss, Fig.), method of joints. (S-26 Q.6a) 			
Truss by method of sections <ul style="list-style-type: none"> Forces in BC, BE and AE (Fig.) by method of sections. (W-25 Q.6c) Forces in AB, BC and CD (Fig.) by method of section. (S-26 Q.6b) 	6 M	W-25, S-26	High
Types of trusses – enlist / draw sketches <ul style="list-style-type: none"> Enlist any four types of trusses. (S-26 Q.1e) Draw sketches of any four types of trusses. (S-26 Q.4a) 	2 M, 4 M	S-26	Medium
Assumptions made in analysis of simple frames <ul style="list-style-type: none"> State the four assumptions made in analysis of simple frame. (S-26 Q.3d) 	4 M	S-26	Medium
Methods of analysis of frames – explain one <ul style="list-style-type: none"> State the method of analysis of the frame and explain any one in details. (W-25 Q.4e) 	4 M	W-25	Medium
Deficient and redundant frames; graphical method (theory) In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	Low

Exam tips from the two papers

- Both papers had the same structure: Q.1 (2 M definitions), Q.2–Q.4 (4 M), Q.5–Q.6 (6 M). Most of the choice in Q.2–Q.6 is numerical — **15 of 19** sub-questions in W-2025 and **11 of 19** in S-2026 were numericals (slope/deflection, fixed beam FEM, three moments, moment distribution, trusses).
- The **same beam ABCD (6 m spans, I, 2I, 1.5I) for distribution factors** appeared in both papers — learn modified stiffness $(3/4) \cdot I/L$ for a simply supported far end.
- A continuous beam **fixed at one end** solved by three moments (imaginary span) came in both papers as a 6-mark question.
- Q.6 in both papers had **one truss by method of joints and one by method of sections** (6 M each). Always find reactions first and state tension / compression.
- Learn standard values: SS beam UDL $\theta = wL^3/24EI$, $y = 5wL^4/384EI$; central load $\theta = WL^2/16EI$, $y = WL^3/48EI$; cantilever W at end $WL^2/2EI$, $WL^3/3EI$; UDL $wL^3/6EI$, $wL^4/8EI$; fixed beam FEM $wL^2/12$, $WL/8$, Wab^2/L^2 ; three-moment terms $6A\bar{x}/L = wL^3/4$ (UDL), $Wab(L+a)/L$ (point load).
- Diagrams expected: elastic curve with slope and deflection, fixed beam BMD (free + fixed moment diagrams), continuous beam SFD/BMD, portal frames, types of trusses, perfect/imperfect frames.

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