



**K. K. Wagh Institute of Engineering Education & Research, Nashik**  
(An Autonomous Institute From A.Y. 2022-23)

InSem Examination-I Winter2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:I
Class:PG-I	Program:M.Tech
Branch Code:CIV	Pattern:2024
Name of Course:Advanced Design of Steel Structures	Course Code:2404504(A)
Max. Marks:30	Duration:1.15 Hrs.

**Instructions:** Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains two page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome.
6. Use of IS 800:2007, IS 875(Part 3):2015 and steel table is allowed

**Marks CO**

**Question No. 1**

- 1 a) Explain what castellated beams are and their modes of failure with suitable sketches. (7) CO1

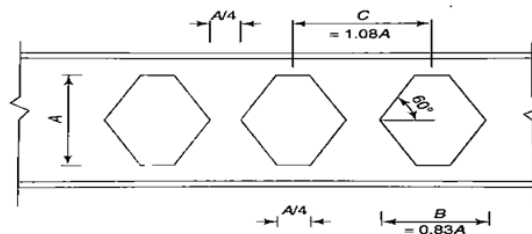
**Question No. 2**

- 2 a) Calculate the wind pressure and design load on the hoarding of size 3m x 2m. It is to be erected on the roof of a 7m high building near Nashik. The base of the hoarding is 1m above the roof level. Assume terrain category 2. (8) CO1

**OR**

- 2 b) Design a castellated beam in grade Fe410 steel to carry an imposed load of 3kN/m and dead load of 5kN/m over a simply supported span of 18m. Assume that the compression flange is fully restrained. Check for deflection, bearing & web buckling is not needed. (Section can be chosen from fig. 2b) (8) CO1

Sectional properties of castellated beams



Original	Castellated	Over size (mm)	Weight (N/m)	Size of castellated holes			Net Moment of inertia $I_x$ (cm <sup>4</sup> )	Design radius of gyration $r_x$ (mm)	Net elastic modulus $Z_x$ (cm <sup>3</sup> )
				Depth (mm) A	Width (mm) B	Spacing (mm) C			
ISMB-150	NCB-150	225 × 80	150	152	126	164	1723	15.2	152.51
ISMB-175	NCB-175	263 × 90	196	177	146	191	3012	17.0	228.63
ISMB-200	NCB-200	300 × 100	242	203	168	219	5314	19.8	352.52
ISMB-225	NCB-225	338 × 110	311	228	189	246	8168	21.5	481.91
ISMB-250	NCB-250	375 × 125	373	254	210	274	12178	24.4	646.07
ISMB-300	NCB-300	450 × 140	460	304	252	328	20297	25.9	898.1
ISMB-350	NCB-350	525 × 140	524	355	294	382	32157	25.8	1219.22
ISMB-400	NCB-400	600 × 140	615	406	336	437	48279	26.9	1601.31
ISMB-450	NCB-450	675 × 150	724	457	378	492	71693	27.1	2113.27
ISMB-500	NCB-500	750 × 180	869	508	420	547	106483	31.7	2824.49
ISMB-550	NCB-550	825 × 190	1040	558	462	601	152750	33.5	3685.16
ISMB-600	NCB-600	900 × 210	1230	609	504	656	216098	37.1	4778.29

fig. 2b

**Question No. 3**

- 3 a) Explain different types of microwave towers with suitable sketches (wherever applicable). (7) CO2

**Question No. 4**

- 4 a) A 40 m high microwave antenna lattice tower is to be built near Nashik. The terrain at the site is nearly a level ground with terrain of category 2. The diameter of the hemispherical antenna disc, fixed at the top, is 3.5m. The width of the tower, at the top is 4.5m. Select a suitable configuration for the tower containing four segments and determine gravity loads only, for the following data: (8) CO2

Weight of antenna disc and fixtures: 10 kN

Weight of platform at the top: 0.85 kN/m<sup>2</sup>

Weight of railing at top: 0.42 kN/m

Weight of ladder and the cage: 0.68 kN/m

Weight of miscellaneous item: 3.1 kN.

**OR**

- 4 b) A 30 m microwave tower is to be built in three segments near Delhi. The terrain at the location is nearly level ground. It has to carry a 2.5m diameter hemispherical antenna disc at the top. Determine the gravity loads only. The necessary data is given below: (8) CO2

The width of the top of the tower = 3.5m

Weight of antenna disc and fixtures: 12 kN

Weight of platform at the top: 0.60 kN/m<sup>2</sup>

Weight of railing at top: 0.4 kN/m

Weight of ladder and the cage: 0.70 kN/m

Weight of miscellaneous item: 3.5 kN

Terrain category – III

..... End of question paper.....