16/12/2025

TE/civil/sem-VI/CBCGS/R-19/c-scheme/D&DOSS/SH-2025

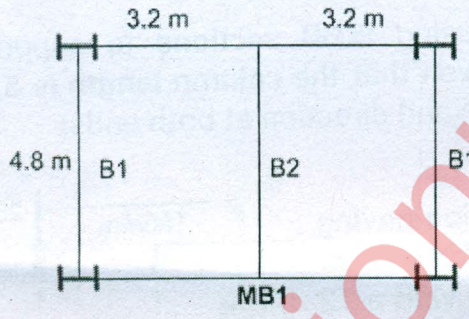
(4 Hr) [Maximum Marks - 80

QP-10095838

N.B.
1. Question 1 is compulsory. Attempt any three questions from the remaining four.
2. Provide neat, proportionate, and labeled sketches where necessary.
3. The use of IS 800:2007 and standard steel tables is permitted.
4. You may assume suitable data where required, provided it is clearly stated and justified.
5. Unless otherwise specified, use steel grade Fe410 and bolts of grade 4.6.
6. All sketches must be neat, well-proportioned, and clearly labeled.

Q.1 a Design laterally supported beams **B2** and **MB1** using appropriate **ISMB sections** for a flooring system, considering that the **top flange of the beam is embedded in the slab**, and design the **beam-to-beam connections** between them, given the following data: **32**

- Thickness of slab = 150 mm
- Thickness of wall = 230 mm
- Height of wall over all beams = 1.5 m
- Unit weights: Concrete = 25 kN/m³, Brick wall = 20 kN/m³

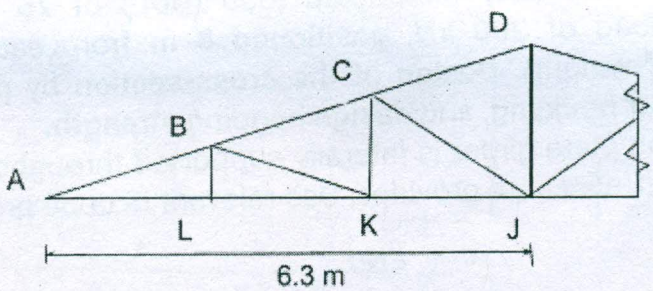


Load Calculations	4 marks
Design of Beam B2 -	8 marks
Design of Beam MB1 -	8 marks
Connection Design -	4 marks
Drawing -	8 marks

OR

Q.1 b Determine the **panel point loads** for a given **roof truss** due to **dead load (DL), live load (LL), and wind load (WL)**, and subsequently **design the truss members AB, AL, and BL**, considering that the truss is to be constructed in an **industrial area of Nagpur**, with the following data: **32**

Angle at joint A = 20° K_1 = 1.0, K_2 = 0.98, K_3 = 1.0 (Cpe − Cpi) = −0.6	Spacing between trusses = 3.0 m Span of truss = 12.6 m Weight of GI sheets = 185 N/m² Self-weight of purlin = 250 N/m



PTO

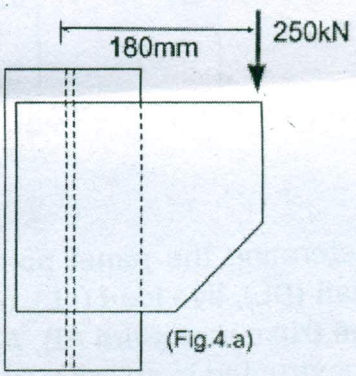
Q.2 a) **Design a built-up column** consisting of two ISMC channel sections placed face to face to safely carry a factored axial compressive load of **1280 kN**, when the effective length of the column is **6.8 m** with both **ends fixed**, include bolted laced connection. 10
(Design of column 08 marks; detailed drawing - 02 marks)

b) **Design a rectangular slab base** for a column consisting of **ISHB 200 @ 366N/m** carrying a **factored axial load of 1050 kN**, considering **M15 grade concrete**, and perform all necessary **design checks.** 06
(Design of gusset base 04 marks, detailed drawing - 02 marks)

Q.3 a) **Design the gusseted base** for a **column ISHB 300 @ 576 N/m** carrying a **factored axial load of 1650 kN**, considering **M20 grade concrete**. perform all necessary **design checks.** 10
(Design of gusset base 08 marks, detailed drawing - 02 marks)

b) **Design** a rolled steel **column** using **ISHB sections** to support a **factored axial load of 850 kN**, given that the **column length is 5.6 m** and it is effectively held in position and direction at both ends. 06

Q.4 a) Design a **bolted bracket connection** having an eccentricity of 180 mm from the web of an ISHB 250 @ 500 N/m column, with a 12 mm thick bracket plate and 20 mm diameter bolts, to safely carry an end reaction of 250 kN due to factored load. Refer fig.4.a. 08



(Fig.4.a)

b) **Determine the design bending strength (Md)** of an **ISMB 500 @ 1016 N/m (laterally unsupported beam)** having a **span of 4.1 m**, using the relevant **IS code tables**, and subsequently calculate the safe uniformly distributed load **(UDL)** that can be applied over the beam. 08

Q.5 a) **design a simply supported welded plate girder** of **24 m span** subjected to a uniformly distributed load (UDL) of **75 kN/m** and concentrated load of **200 kN, positioned 8 m** from each support **(excluding self-weight). Design of the cross-section** by **performing checks for shear buckling, and design bending strength.** 16
Assume that the plate girder is laterally supported throughout and no intermediate stiffeners are provided, Use relevant IS code provisions.

END...