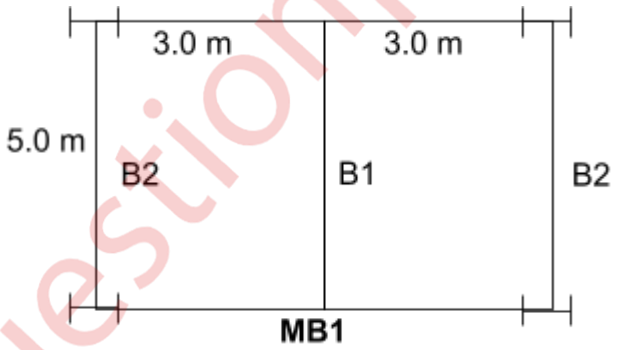
(4 Hr) **[Maximum Marks - 80]**

N.B. 1. Question **No. 01 is compulsory**, attempt any **three** out of the remaining four questions.
2. Draw neat and proportionate **sketches** whenever necessary.
3. Use of **IS 800 and steel tables** is permitted.
4. Assume **suitable data** if necessary, and justify the same.
5. Use steel of **grade Fe410** and bolts of **grade 4.6.**

Q.1 a For the following flooring system, design laterally supported beams B1 and MB1 using appropriate ISMB sections, also design a beam-to-beam connections between them, assuming the top flange of the beam is embedded in the slab. Design flooring systems for the following data, **32**

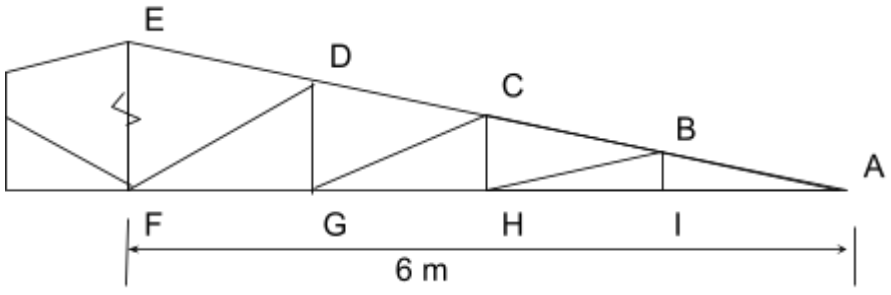
- The thickness of the Slab - is 150 mm
- The thickness of the wall - 200 mm.
- Height of wall over all beams - 1.2m
- Unit weight - (Concrete-25 kN/m^3 , Brick Wall - 20 kN/m^3)
- All beams are laterally restrained.
- All columns are ISHB 350 @ 661.2 N/m



OR

Q.1 b Find the panel point load for a given roof truss for DL, LL, and WL and design members AB, AL, and BL. Considering the truss to be constructed in the industrial area of Bhopal. The angle at joint A is 20°. **32**
Assume K_1 = 1.0, K_2 = 0.98, K_3 = 1.0, and and (C_{pe} - C_{pi}) = -0.3,

- Spacing between trusses - 5.0 m; the span of truss - 12.0 m
- wt of GI sheets - 180 N/m^2 .
- Self-weight of Purlin - 200 N/m, Assume suitable data.
- The Basic wind Speed of Bhopal 'Vb' = 39 m/s



PTO

Q.2 **a)** A column ISHB 350 @ 661.2 N/m; carries a factored axial load of 1600 kN. Calculate the size and thickness for the bolted **gusseted base**, also calculate the number of bolts required if bolt diameter = 20 mm, assume M20 grade of concrete. *(Design of gusset base 08 marks, detailed drawing - 02 marks)* **10**

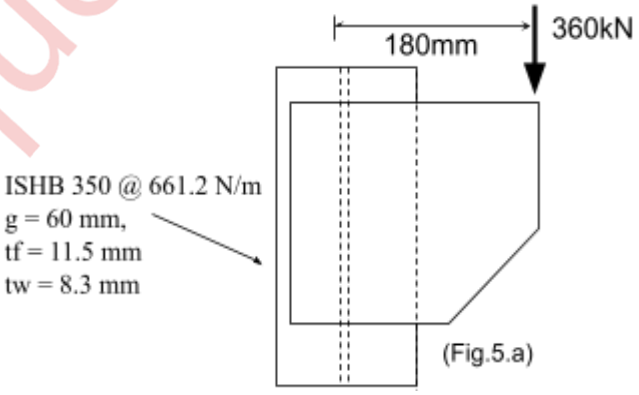
b) Determine the design capacity of the column section in kN for the section ISHB 350 @ 661.2 N/m, used as a column with an effective height 4.0 m. **06**

Q.3 **a)** **Design a built-up column** with two channel sections that are placed face to face to support a factored axial compressive load of 1450 kN; if the effective length of the column is 4.2 m, design a suitable bolted laced connection, provide all checks, and draw a detailed diagram. *(Design of column 08 marks; detailed drawing - 02 marks)* **10**

b) A column consists of ISHB 350 @ 661.2 N/m carrying a factored load of 1100 kN. Design a **rectangular slab base**, considering the M15 concrete grade. Dont design connections. *(Design of base 04 marks, detailed drawing - 02 marks)* **06**

Q.4 Design a simply supported welded plate girder for span 30 m which is subjected to a UDL of 80 kN/m over the span, excluding the self-weight of the plate girder. **i)** Design the cross-section and classify, **ii)** provide check for shear buckling **iii)** Provide check for design bending strength, **iv)** provide appropriate curtailment at 5m and 10m of span. The plate girder is laterally supported throughout without intermediate stiffeners. **16**

Q.5 **a)** Design a bolted bracket connection with an eccentricity of 180 mm from the web of the column. The column is of ISHB 350 @ 661.2 N/m; and carries an end reaction of 360 kN due to factored load. The thickness of the bracket plate is 12 mm, and the diameter of the bolts is 24 mm. (Fig.5.a) **08**



(Fig.5.a)

b) Determine the design bending strength (M_d) of a beam ISLB 300 @ 369.7 N/m which is used as a laterally **unsupported beam** using IS 800:2007 table No. 13(a) & 14; the effective length of the beam is 4.8 m. also determine the amount of **UDL** that can be applied over the span safely. **08**

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