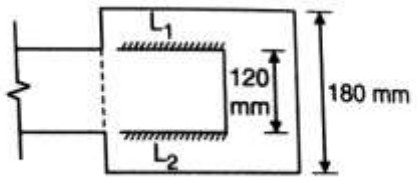
(3Hours) **Max Marks=80**

Note 1. Question **1** is compulsory
2. Attempt any **3** out of five questions
3. Assume any suitable data where ever required

Q.1 Attempt any **four**

a. Determine the length of 12 mm size fillet weld to connect two plate 120 mm X 10 mm and 180 mm X 10 mm in Fig.. The load to be carried is 400 kN. Consider grade of plates Fe410 and welds are to be made in workshop. **05**



b. Explain the failures of Bolt. **05**

c. Explain WSM and LSM method of design in Steel Structures **05**

d. Enlist the Types of steel section used in Steel Structures give the advantages of steel structures **05**

e. Explain and classify section in steel design based on moment versus rotation capacity. **05**

Q.2 **a.** Design a slab base for a column ISHB 300 @ 58.8 Kg/m subjected to a service load of 1000 kN. The grade of concrete pedestal is M20 and Soil Bearing Capacity of soil is 150 kN/m^2 , Design a slab base and concrete base by bolted connection **10**

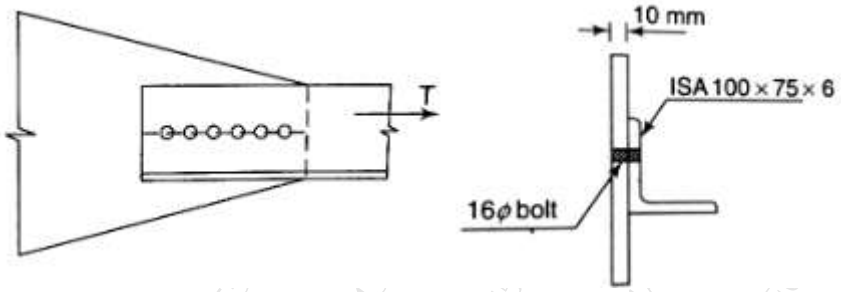
b. A batten column of 6.5 m long is carrying a factored load of 2000 kN. The column is restrained in position and in direction at both ends. Design a built-up column-using channel sections placed back to back. Design batten plates using bolt connection. **10**

Q.3 **a.** Calculate the strength of a 20 mm diameter bolt of grade 4.6 for the following cases. The main plates to be joined are 12 mm thick **10**

A) The plates are connected by Lap Joint
B) The plates are connected by single cover butt joint, cover plate being 10 mm thick
C) Double cover butt joint, each of the cover plate being 8 mm thick.

b. Compute the size of web and size of flange for plate girder of simply supported bridge deck beam with clear span 24 m, Subjected to D.L. of 20 kN/m (excluding self-weight), L.L. 10 kN/m and two concentrated loads 200 kN each at 6 m from each end . Assume that the top compression flange of Plate Girder is restrained laterally and prevented from rotating. Use Fe-415 grade of steel. Design as an unstiffened plate girder with thick web. **10**

Q.4 **a.** A single unequal angle 100 X 75 X 6 is connected to a 10- mm thick gussete plate at the ends with six 16 mm diameter bolts to transfer tension as shown in figure. Determine the design tensile strength of the angle assuming that the yield and the ultimate stress of steel used are 250 MPa and 410 Mpa, if the 100 mm leg is connected to gussete plate. **10**

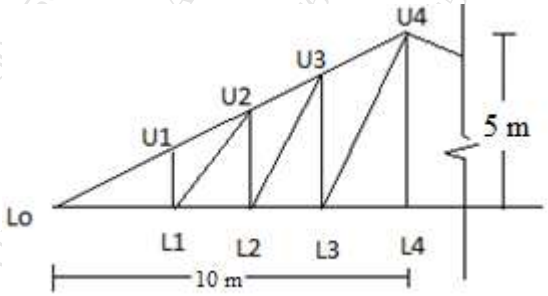


b. A column ISHB 350 at 661.2 N/m carries compressive factored load is 1400 kN. Design suitable bolted gusset base. The base rests on M15 grade concrete pedestal. Use 24 mm diameter bolts of grade 4.6 for making the connection. The SBC of soil is 180 kN/m^2. Sketch plan, elevation and side view of the gusseted base which is designed. **10**

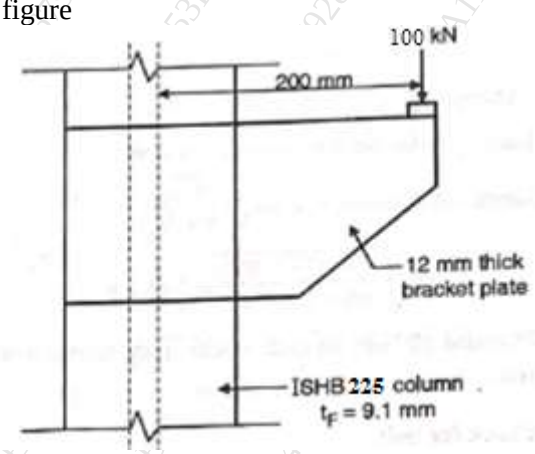
Q.5 **a.** Design a built-up column with two channel sections which are placed face to face to support factored axial compressive load of 1500 kN, if the effective length of column is 5.5 m. Design the appropriate section, spacing between channels and suitable bolted lacing system for diameter 20 mm 4.6 Bolts. **10**

b. Design a laterally supported beam of effective span 6m for the following data , Grade of steel – Fe 410, Factored maximum BM= 190 kNm, Factored maximum shear force = 200 kN , Also check the beam for deflection. **10**

Q.6 **a.** A truss as shown in figure is used for an industry situated in Mumbai. The truss is covered with AC sheet 171 N/m^2. Calculate panel point dead load, live load and wind load. Assume K_1 =1, K_2 =1,(C_{pe} - C_{pi})= - 0.9 ,K_3 = 1 ,self-weight of purlin is 200 N/m and spacing of truss is 4m and find the force in member LoL_1,LoU_1 **10**



b. Design a bracket connection using 4.6 black bolt of suitable size to transmit a factored load of 100 kN (applied on a 12 mm thick bracket plate) to the flange of a column ISHB 225. The load eccentricity is 200 mm measured from the column axis as shown in figure **10**



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