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5E3153

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B.Tech. (Sem.V) (Main/Back) Examination- Dec. 2012
Civil Engineering
5CE3 Steel Structure-I

Time : 3 Hours]

[Total Marks : 80
[Min. Passing Marks : 24

Instructions to Candidates :
Attempt any five questions, selecting one question from each unit. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

UNIT-I

1. (a) Briefly discuss merits and demerits of welded connections. (4)
   (b) Draw cross-sections of a fillet weld and a double V butt weld. (2)
   (c) Fig. given below shows an eccentrically loaded fillet weld connection. Calculate the maximum factored value of load P that can be safely allowed. (10)

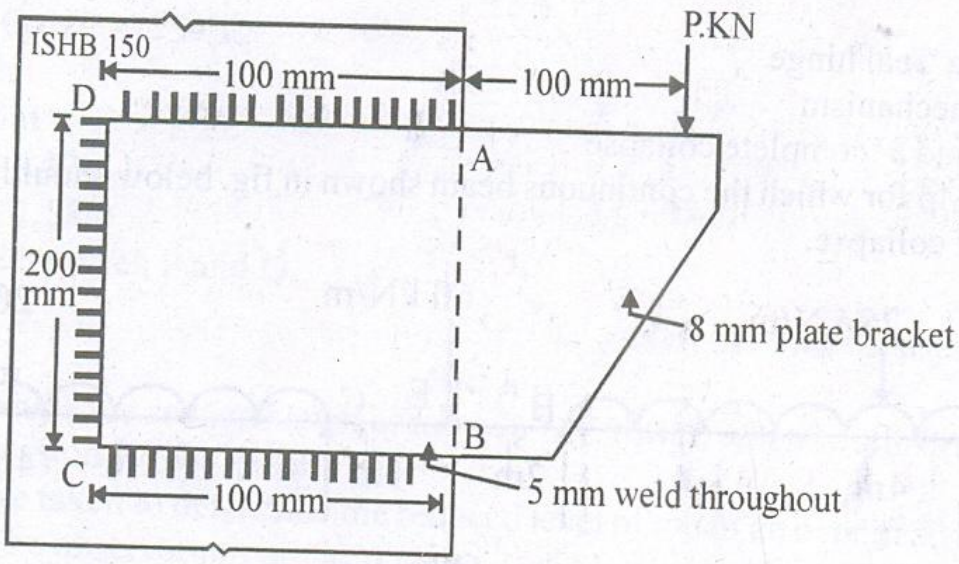
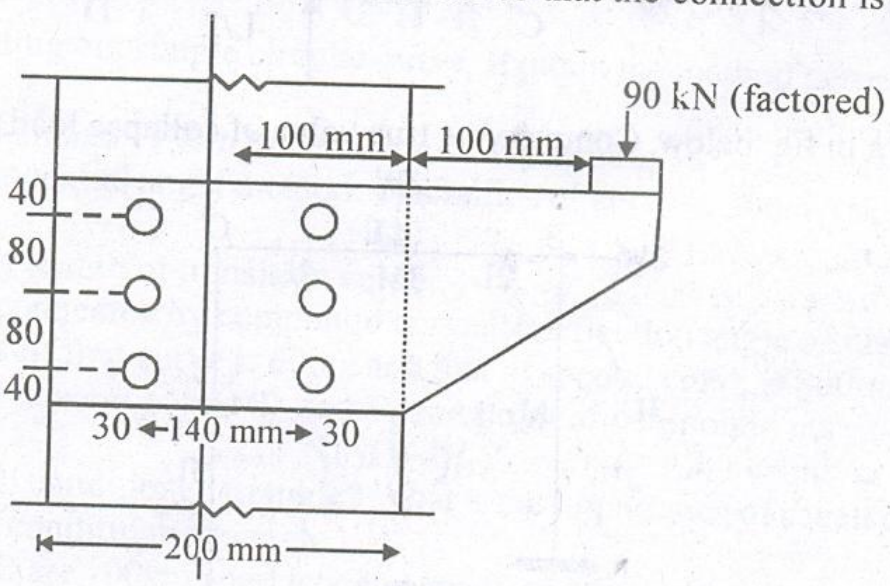


Fig.

OR

1. (a) Design a lap joint between two plates 80 mm × 16 mm and 80 mm × 12 mm so as to transmit a factored load of 75 kN. Use 16 mm bolts of grade 4.6. (6)
   (b) Consider a plate bracket 10 mm thick connected to the flange of a column ISHB 200 @ 37.3 kg/m by 6 bolts of grade 4.6 as shown in Fig. What should be the minimum size of bolts so that the connection is safe. (10)



UNIT-II

2. (a) An ISA 125 × 75 × 8 mm is used in a steel roof truss as discontinuous strut. Find its compressive strength if it is 2.1 m long between centres of bolted connection. (6)
   (b) An ISHB 250 @ 51 kg/m is to be used as column in a steel building. It is strengthened by welding a plate 300 mm × 12 mm to each flange symmetrically. Find the design factored compressive load for the column if it is 3.2 m long with its ends restrained against position as well as direction. (10)

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OR

2. Design a built up column taking two channel sections to be placed back to back for an axial factored load of 1500 kN. The column height is 4.0 m with top and bottom hinged. Also design a single system of lacings for the column. **(16)**

UNIT - III

3. (a) What do you understand by "buckling of web" and "crippling of web". Explain with diagrams. **(6)**
   (b) A beam of effective span 4.5 m is simply supported at the ends and is subjected to a uniformly distributed load of 30 kN/m over the whole span. Design a suitable I section if its compression flange is laterally supported. Check for deflection also. **(10)**

OR

3. Design a two tier grillage foundation for a column carrying an axial load of 1600kN. The column rests centrally on a steel base plate 650mm × 650mm. The bearing pressure on soil is limited to 180kN/m^2. **(16)**

UNIT - IV

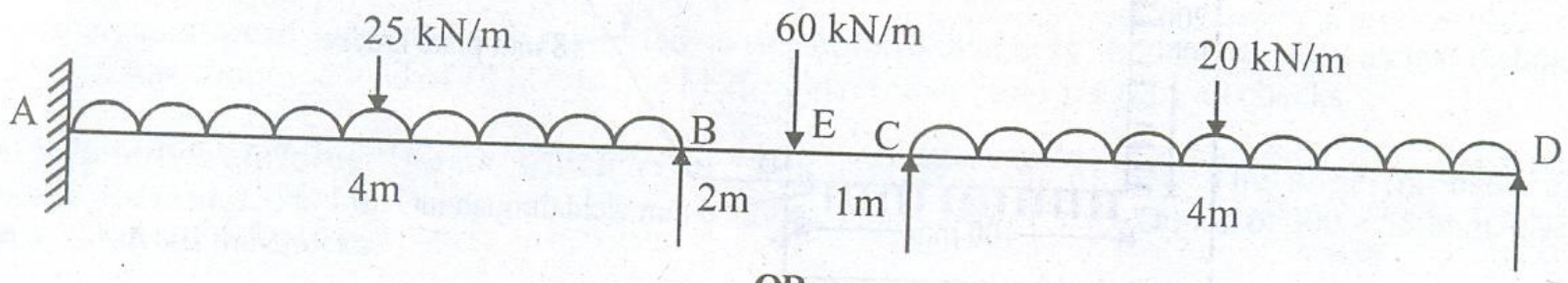
4. (a) Draw two views of a gusseted base connection, with bolts, for a column and label the components. **(6)**
   (b) Design a slab base for a column of section ISHB 300 @ 58.78 kg/m, carrying a factored load of 1000 kN. Bearing capacity of soil may be taken as 300 kN/m^2. Assume Fe410 grade for steel and M15 for concrete. **(10)**

OR

4. (a) Discuss the steps involved in the design of an eccentrically loaded tension member. **(6)**
   (b) A tie member in a bracing system consists of a single unequal angle of size 125 × 75 × 8 mm. Its longer leg is connected at the ends to a gusset plate 10 mm thick with 5 bolts of 20 mm diameter at a pitch of 60 mm and end distance 30 mm. Taking edge distance as 50 mm, calculate the tensile capacity of the member. **(10)**

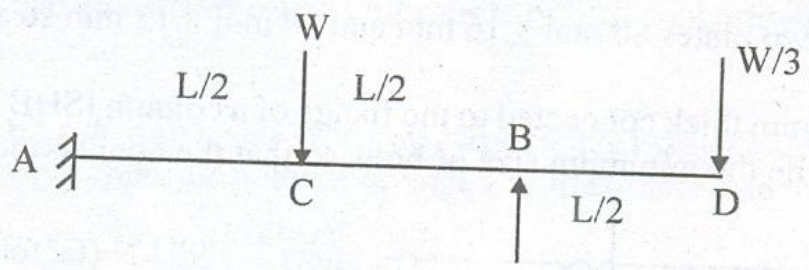
UNIT - V

5. (a) Differentiate between :
   (i) a 'plastic hinge' and a 'real hinge'
   (ii) a 'structure' and a 'mechanism'
   (iii) a 'partial collapse' and a 'complete collapse'. **(6)**
   (b) Determine the uniform Mp for which the continuous beam shown in fig. below should be designed. Take load factor 1.7. Also comment on the type of collapse. **(10)**



OR

5. (a) Calculate the collapse load for the beam of uniform Mp, shown in fig. below. **(6)**



   (b) For the portal frame shown in fig. below, Compute the true value of collapse load. **(10)**