CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐   15CT72

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Design of Steel Structures

Time: 3 hrs.   Max. Marks: 80

Note: 1. *Answer FIVE full questions, choosing ONE full question from each module.*
       2. *Use of IS 800-2007 and steel table is required.*

Module-1

1   a.   Explain the difference between working stress design and limit state design.   **(05 Marks)**
     b.   Mention the classification of sections as per IS 800 : 2007.   **(08 Marks)**
     c.   Explain the failure criteria for steel.   **(03 Marks)**

OR

2   a.   Determine the strength and effieiciency of butt joint. The main plates 10 mm and 8 mm and are connected using 6 mm thick cover plates on top and bottom. Use M_{18} grade 8.8 HSFG bolts. Take grade of plate Fe 490. The bolts are arranged in diamond pattern (Fig. Q2 (a)).   **(08 Marks)**
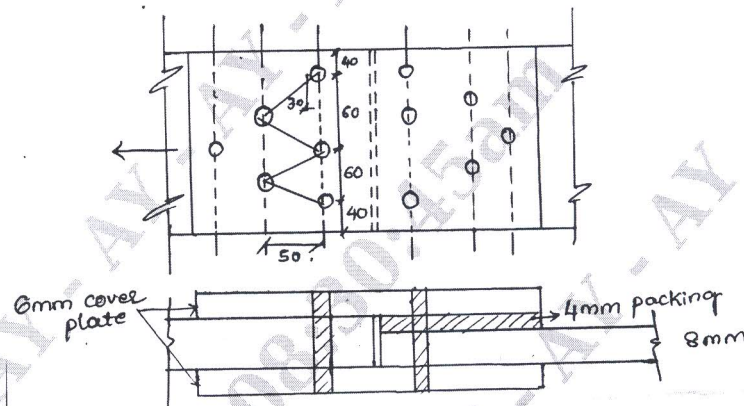

Fig. Q2 (a)

     b.   Determine the "load P" the bracket can carry safely. Use M_{20} 5.6 grade black bolt. The bracket is connected to column ISHB 300 (Fig. Q2 (b))   **(08 Marks)**
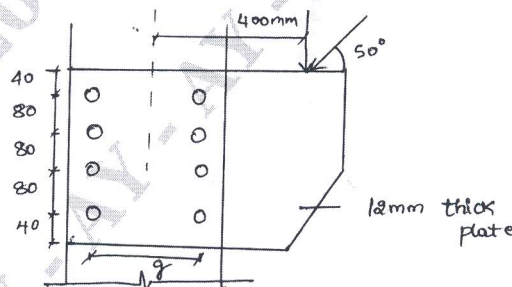

Fig. Q2 (b)

Module-2

3   a.   Define welding. Mention the advantages and disadvantages.   **(08 Marks)**
     b.   A tie member consists of two ISMC 250. The channels are connected on either side of a 12 mm thick gusset plate. Design the welded joint to develop the full strength of the tie. However the overlap is to be limited to 400 mm.   **(08 Marks)**

OR

4 a. Explain the different types of welding. **(08 Marks)**
   b. Determine the 'size of the weld' for the shown bracket connection. (Refer Fig. Q4 (b)) **(08 Marks)**
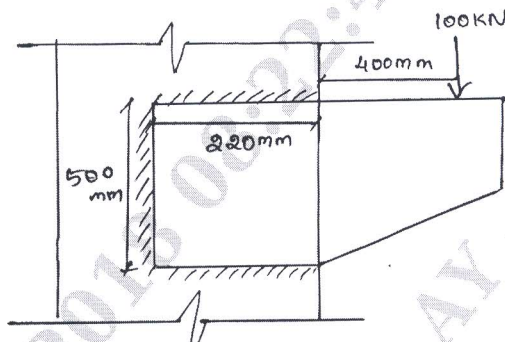
Fig. Q4 (b)

Module-3

5 a. Explain (i) Shape factor   (ii) Plastic hinge concept   (iii) Plastic collapse load
       (iv) Plastic moment. **(06 Marks)**
   b. Mention the requirements of plastic design. **(04 Marks)**
   c. The three span continuous beam shown in Fig. Q5 (c) is subjected to a total design load of 30 kN/m. Over its whole length, check whether an ISMB 225 in Fe 410 steel would be a suitable section. It may be assumed that the beam is adequately braced against lateral deflection and twist over its whole length. **(06 Marks)**
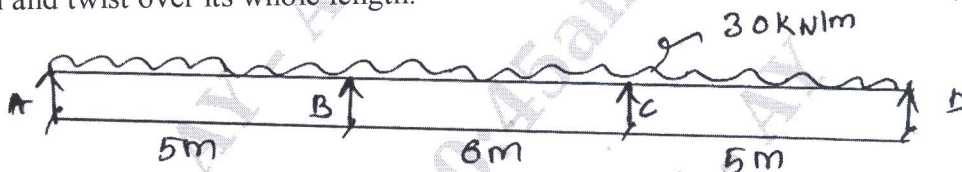
Fig. Q5 (c)

OR

6 a. Explain the different types of tension members. **(08 Marks)**
   b. Determine the strength of the plate 160mm $\times$ 10mm connected with bolts subjected to a force as shown in Fig. Q6 (b). Use M_{18} dia bolts. **(08 Marks)**
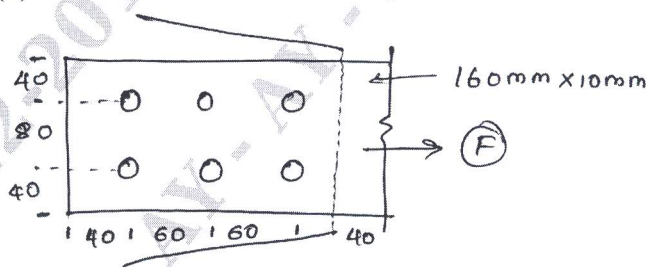
Fig. Q6 (b)

Module-4

7 a. Explain the failure modes of compression member. **(06 Marks)**
   b. Determine the design axial load on the column section ISMB 350, given that the height of column is 3.0 m and that it is pin ended. Also assume the following $f_y = 250$ N/mm^2, $f_u = 410$ N/mm^2, $E = 2 \times 10^5$ N/mm^2. **(10 Marks)**

OR

8 a. Briefly explain the design of compression members. **(08 Marks)**

   b. Calculate the compressive resistance of compound column consisting of ISHB 300 with one cover plate of 350×20 mm on each flange (Fig. Q8 (b)) and having a length of 5 m. Assume that the bottom of the column is fixed and top is rotation fixed translation free and $f_y = 250$ MPa. **(08 Marks)**
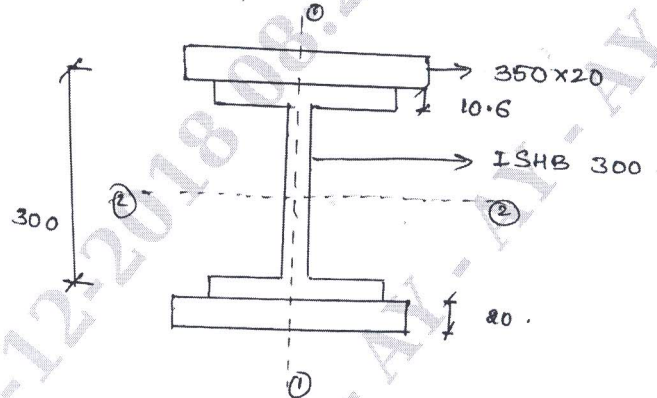

Fig. Q8 (b)

Module-5

9   Design a column base (slab base) and concrete base for a column ISHB 400 subjected to an axial load of 1000 kN. Use M_{20} concrete and SBC of soil is 200 kN/m². Draw neat sketch. **(16 Marks)**

OR

10   Design a simply supported beam of span 5 m carrying a reinforced concrete floor capable of providing lateral resistant to the top compression flange. The uniformly distributed load is made up of 20 kN/m imposed load and 20 kN/m dead load (section is stiff against bearing). Assume Fe410 grade steel. **(16 Marks)**

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