CBCS SCHEME

USN | | | | | | | | | | 15CT72

Seventh Semester B.E. Degree Examination, Aug./Sept.2020
Design of Steel Structures

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of IS:800-2007, SP(6)-1 or steel tables is permitted.

Module-1

1 a. Distinguish between two major philosophy of design. **(06 Marks)**
b. What are advantages and disadvantages of steel structures? **(06 Marks)**
c. Mention the classification of sections as per IS800-2007. **(04 Marks)**

OR

2 a. What are HSFG bolts? What are the advantages of HSFG bolts? **(06 Marks)**
b. Two plates of 10mm and 18mm thick are to be joined by double cover butt joint. Design the joint for the data. Factored design load = 750kN, bolt diameter = 20mm, grade of steel = Fe410 cover plates on each side 8mm, grade of bolts 4.6. **(10 Marks)**

Module-2

3 a. What are the requirements of an ideal welded joint? **(04 Marks)**
b. A bracket plate is used to transfer the reaction of a beam to a column flanges as shown in Fig.Q.3(b). A fillet weld of 6mm is used to connect the plate and column flange. Find the maximum load that can be taken by the bracket connection at an eccentricity of 100mm. **(12 Marks)**

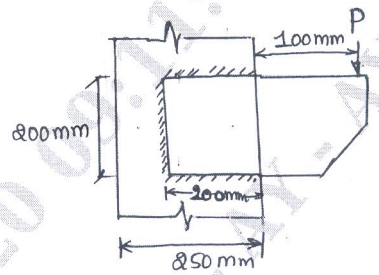

Fig.Q.3(b)

OR

4 a. What are advantages and disadvantages of welded connection? **(08 Marks)**
b. 18mm thick plate is joined to a 16mm thick plate by 200mm [effective] butt weld. Determine the strength of joint if
i) A double V-butt weld is used
ii) A single V-butt weld is used
Take $f_u = 410N/mm^2$, and $\gamma_{mw} = 1.25$ **(08 Marks)**

Module-3

5 a. Define: i) Plastic hinge ii) Shape factor **(04 Marks)**
b. A single unequal angle ISA 100 × 75 × 6mm is connected to 10mm thick gusseted plate with six-16mmϕ bolts to transfer tension. Determine design tensile strength if longer legs are connected to gusset. Assume pitch and edge distance of 40mm each. **(12 Marks)**

OR

6 a. Analyze the continuous beam ABC subjected to working loads shown in Fig.Q.6(a) and determine the maximum plastic moment. Take load factor of 1.85. **(08 Marks)**

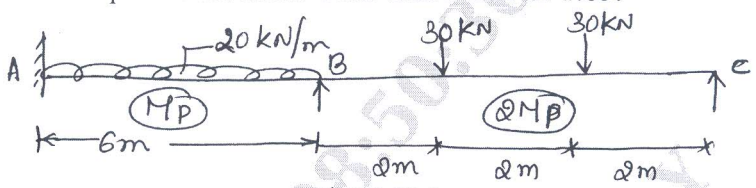

Fig.Q.6(a)

b. Determine the tensile capacity of a tie member of $2L_S$ ISA 100 × 65 × 10mm connected longlegs to a gusset plate using four bolts of 20mm diameter when.
   i) Angles are on both sides of the gusset plate with tack bolts.
   ii) Angle are on the same side of the gusset plate with tack bolts.
   iii) With tack bolts. **(08 Marks)**

Module-4

7 a. Explain briefly: i) Imperfection factor ii) Stress reduction factor. **(06 Marks)**

b. Design a laced column with two channels back to back of 8m to carry an axial load of 1000kN. The columns are hinged at the both ends. **(10 Marks)**

OR

8 Design a compression member using double channel section [2 ISLC 300 @ 33.1 kg/m] face to fall to carry a factored load of 1600kN. The length of the column is 5m with one end fixed and one end hinged. Assume M_{18} bolts and f_{cd} = 200N/mm^2. Also design single lacing system. **(16 Marks)**

Module-5

9 a. Briefly explain types of column bases. **(04 Marks)**

b. Design a gusseted base for column ISHB 350@ 661N/m carrying a factored an axial load of 2500kN. The base plate rests on M20 grade concrete. M_{24} diameter bolts of grade 4.6. **(12 Marks)**

OR

10 Simply supported beam ISMB 350@ 52.4kg/m is used over a span of 5m. The beam carries an UDL live load of 20kN/m and dead load 15kN/m. The beam is laterally supported throughout. Check the safety of the beams. **(16 Marks)**

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