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10CV72

Seventh Semester B.E. Degree Examination, June/July 2019
Design of Steel Structures

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Outline the differences between working stress method and limit state method. **(06 Marks)**

b. State and expression the design actions to be considered in the design of steel structures. **(06 Marks)**

c. List the advantages and disadvantages of steel structures. **(08 Marks)**

2 a. Explain with neat sketch, the types of failure in bolted connection. **(06 Marks)**

b. Determine the strength and efficiency per pitch of the double bolted lap joint connecting two plates of Fe410 grade with one plate having thickness of 10mm and other plate having thickness of 14mm, with 40mm edge distance and pitch of 50mm. The bolts used are 18mm diameter of class 4.6 with fully threaded. **(06 Marks)**

c. Design bolted connection between flange of the column ISHB450@907.4 N/m and bracket plate. The bracket plate carries a load of 150 kN at an eccentricity of 350mm. Adopt HSFG bolts of 24mm diameter and class 8.8. Assume pitch of bolt 60mm and distance between two rows as 140mm. **(08 Marks)**

3 a. Outline few advantages and disadvantages of welded connection. **(05 Marks)**

b. Solve a welded connection for a tension member consisting of ISMC300@ 351.2N/m to carry a load equal to full strength of the member, the length of joint is limited to 250mm (Take size of weld 6mm). **(05 Marks)**

c. A bracket plate of thickness 16mm, is welded to the flange of column ISHB400@759.3 N/m. If the size of weld is 8mm, compute the reaction that can be allowed on the bracket in Fig.Q3(c). **(10 Marks)**

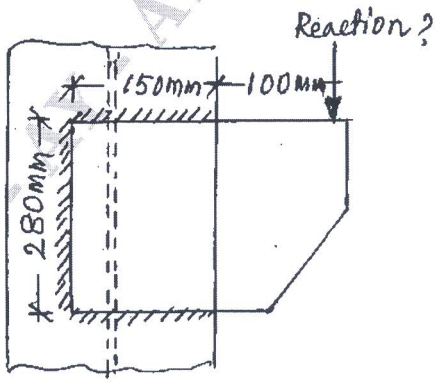

Fig.Q3(c)

4 a. Define the terms, plastic hinge, rotational capacity, collapse mechanism, shape factor and upper bound theorem. **(05 Marks)**

b. Compute the shape factor for an equilateral triangle of base 'B' and height H. **(05 Marks)**

c. Determine plastic moment capacity for the beam shown in Fig.4(c). Take factor load of 1.5. **(10 Marks)**

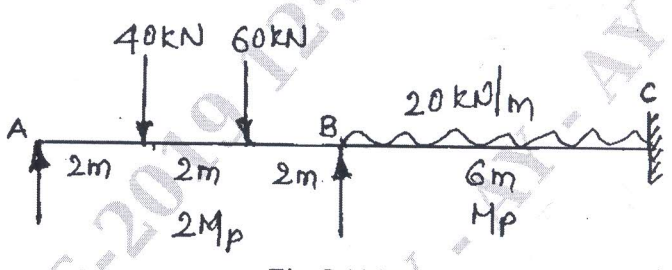

Fig.Q4(c)

PART – B

5 a. What is Lug angle? Why it is used and what are the design requirements. **(04 Marks)**

b. Design a tie member to carry an axial load of 400 kN (working load). Use double angle with M_{20} HSFG bolts property class 10.9. Take $\mu_f = 0.55$. **(08 Marks)**

c. Determine tensile strength of a tie member 2ISA 80 × 80 × 80mm connected to a gusset plate on either side using 6mm fillet weld. The length of weld is 100mm and 80mm. **(08 Marks)**

6 a. Design a single angle section for a discontinuous strut to carry a load of 100kN, if the length of member is 2.5meter. **(10 Marks)**

b. Design a compression member using double channel section face to face to carry a factored load of 1500kN. The length of column is 4.5m with one end fixed and other end higher. Also design lacing. **(10 Marks)**

7 a. Design a slab base for column ISHB@576.8N/m, subjected to carry working load of 1000kN. The grade of concrete for pedestal is M_{20} and SBC of soil is 180kN/m^2. Also design a concrete base. **(08 Marks)**

b. Design a gusseted base and concrete pedestal for a column to carry an factored axial load of 2750kN. The column is ISHB400@759.3N/m with two cover plates 250 × 20mm on either side. The column is to be supported on concrete pedestal of M_{20} grade. Assuming 5.6 property class with nominal diameter of 22mm. **(12 Marks)**

8 a. Distinguish between laterally restrained and unrestrained beams. (Write sketches required). **(06 Marks)**

b. A hall measuring 5 × 12m consists of 120mm thick RCC slab supported on steel I – section spaced at 3m c/c. Take live load 3.5kN/m^2 and finishes 1.5 kN/m^2. Bearing of wall = 400mm, the beam is laterally restrained. Design one of the interior beam and check the design for deflection, web buckling and web crippling. **(14 Marks)**

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