SV-39

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Seat No.	

T.E. (Civil Engineering) (Part - I) (Semester - V)
(New) Examination, April -2019
DESIGN OF STEEL STRUCTURES
Sub. Code : 66236

Day and Date : Saturday, 27 - 04 - 2019 **Total Marks : 100**

Time : 2.30 p.m. to 5.30 p.m.

Instructions :
1) **Attempt all questions from section I and II.**
2) **Figures to the right indicates full marks.**
3) **Assume any suitable data wherever necessary.**
4) **Use of non-programmable calculator and relevant I.S. 800:2007 and steel table is allowed.**

SECTION - I

Q1) a) Write the advantages and disadvantages of the steel structures. **[4]**

b) Write in short High Strength Friction Grip bolt. **[4]**

c) Design the lap joint between plates of sizes 100×16mm thick and 100×10mm thick so as to transmit a factored load of 100kN using single row of bolts of grade 4.6 and grade 410 plate. Assume e = 30mm, p = 40mm and area of bolt, A_{nb} = 157 mm^2. **[8]**

Q2) a) Explain the term **[6]**

i) Block Shear failure

ii) Gross Section Yielding

b) Find out design tensile strength of angle ISA 100×100×10mm in tension connected to gusset plate 10mm thick through 100mm leg using M20 bolt of class 4.6 in a single line. The yield and ultimate strength of steel are 250MPa and 410MPa. **[12]**

OR

P.T.O.

b) Design a single angle section for a tension member of a roof truss to carry a factored tensile force of 225kN. The member is subjected to possible reversal of stresses due to action of wind. The effective length of member is 3m. Use 20mmϕ shop bolts of grade 4.6 for the connection. Assume steel of grade Fe410 and $f_y = 250\ N/mm^2$. **[12]**

Q3) a) Explain the following term with reference to compression member **[4]**

i) Buckling class of cross section

ii) Effective length of struts.

b) Design a double angle discontinuous strut to carry a load of 160kN. The length of strut between centre to centre of intersection is 2.6m. Assume the angle is connected by two bolts. Take steel of grade Fe410 and $f_y = 250N/mm^2$. **[12]**

SECTION - II

Q4) a) Write step by step procedure for design of built up column. **[4]**

b) Design a built up column composed of two channels placed back to back carrying an axial factored load of 1345kN. The effective length of column is 5.95m. Assume steel of grade Fe410,4.6 grade bolts and $f_y = 250\ N/mm^2$. Design single lacing system also. **[14]**

OR

b) Design a gusseted base for a column ISHB 350 @ 710N/m with two plates 450mm×20mm carrying a factored load of 3600.kN. The column is to be supported on concrete pedestal to be built with M20 concrete. **[14]**

Q5) a) Explain web buckling & web crippling with neat sketch. **[4]**

b) A simply supported beam 5m span carries uniformly distributed load of 40kN/m. In addition, the beam carries a central point load of 50kN. The beam is laterally supported. Design the section and check the section for shear and deflection. **[12]**

Q6) Determine the design forces in the gantry girder carrying manually operating travelling crane for the following data, [16]

Crane Capacity - 200kN

Self-weight of crane girder excluding trolley - 250kN

Self-weight of trolley - 50kN

Minimum hook approach - 1.2m

Wheel base - 3.5m

Centre to centre distance between gantry rails (span of crane girder) - 16m

Centre to centre distance between column (span of gantry) - 6.5m

Diameter of crane wheel - 150mm

Self - weight of rails - 0.3kN/m

Self-weight of girder - 1.5kN/m

Steel of grade Fe410, fy = 250kN/mm^2, f_u = 410N/mm^2.