[Total No. of Questions - 9] [Total No. of Pri d Pages - 4]
(2126)

16184(D) 10 DEC 2016

B. Tech 7th Semester Examination

Design of Steel Structures (NS)

CE-412

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : (i) Attempt one question from each section A, B, C and D.

(ii) Section E is compulsory and all questions carry equal marks.

(iii) Relevant codes are allowed.

SECTION - A

1. (i) What is the use of partial safety factors? How are they different from the factor of safety used in the working stress method? (8)

   (ii) Select a suitable angle section to carry a factored tensile force of 180 kN assuming a single row of M20 bolts and assuming design strength as fy=250 N/mm^2. (12)

2. A tie member in a bracing system consists of two angles 90×90×10 mm bolted to a 12 mm - gusset, one on each side using a single row of bolts and tack bolted. Determine the tensile capacity of the member and the number of bolts required to develop full capacity of the member. What will be the capacity, if the angles are connected on the same side of the gusset plate and tack bolted. (20)

SECTION - B

3. (i) Find the collapse load for the frame of uniform cross section shown in Fig. 1 with applied factored loads equal to 90 kN at the mid-point of AB span and 40 kN at the mid span point of MA. Length of AB is 5 m and MA is also 5 m. Both supports "M" and "N" are hinged. Draw figures to illustrate. (12)

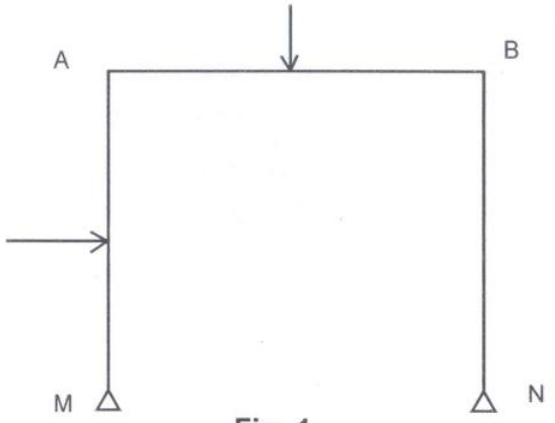

Fig. 1

   (ii) Design the base plate for an ISHB 350 column (h=350 mm, b=250 mm, t_f=11.6 mm and t_w=8.3 mm) to carry a factored load of 1100 kN. Assume Fe410 Grade steel and M20 Grade Concrete. (8)

4. Design a built up faced column with four angles to support an axial load of 1000 kN. The column is 10 m long with both the ends held in position and restrained against rotation. Assume Fe 410 Grade steel. (20)

SECTION - C

5. Design a laterally unsupported beam of effective span 4.5 m for the following data: Grade of steel - Fe 410, Maximum bending moment-500 kNm, Maximum shear force-150 kN. (20)

[P.T.O.]

6. Design an I section truss member for the following data: Length of the member-3.8 m, Factored axial tension-400 kN, factored moment at the two ends of the member about strong axis: Mz=30 kNm and 17 kNm , respectively. Steel of Grade - Fe 410. (20)

SECTION - D

7. (i) Design a welded seat angle connection between a beam ISMB 300 (with t_f=13.1 mm, width of flange=140 mm) and column ISHB 200 for a reaction of 90 kN, assuming Fe410 Grade steel and site welding. Illustrate with figures. (14)

   (ii) Calculate the strength of a 16 mm diameter bolt of Grade 4.6 to join 12 mm thick plates if lap joint is used. (6)

8. (i) Two plates 10 mm and 16 mm thick are to be jointed by double cover butt joint. Design the joint for the following data: factored design load - 600 kN, bolt diameter-20 mm, Grade of steel-Fe410, Grade of bolts-4.6, Cover plates-two (one on each side)-8 mm thick. (12)

   (ii) An ISLC 300 @ 324.7 N/m (Fe 410 Grade steel) is to carry a factored tensile force of 750 kN. The channel section is to be welded at the site to a gusset plate 12 mm thick. Design a fillet weld, if the overlap is limited to 400 mm. (8)

SECTION - E

9. (i) Determine the design bending strength of an ISLB 200 @194 N/m considering the beam to be laterally supported. (5)

   (ii) Two plates 18 mm and 16 mm thick are joined by a single V groove weld with an effective length of 200 mm. Assume Fe 410 Grade steel has been used and that the welds are shop welded. Determine strength of weld. (3)

(iii) Plastic and elastic section modulii of a cross section are 150,000 cubic mm and 100,000 cubic mm respectively. What is the value of shape factor? (2)

(iv) What is the main purpose of lacings and battens? (3)

(v) What are the factors that influence the strength of tension members? (4)

(vi) Explain difference between black bolts and HSFG bolts. (3)