(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2693 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. VII) ODD SEMESTER THEORY EXAMINATION 2012-13

DESIGN OF STEEL STRUCTURES

Time : 3 Hours *Total Marks : 100*

Note : *(i) Attempt **all** questions. Numerical accuracy is as important as procedure.*

(ii) For analysis and design use Limit State Design method, following the recommendations given in IS : 800-2007. Use of this code is allowed.

(iii) Draw neat cross section and longitudinal section in problems. Assume any missing data suitably.

1. Attempt any **four** of the following : **(5×4=20)**

(a) Give the chemical composition of structural steel and discuss the amount of carbon in it.

(b) Give reasons why steel is more suitable than wood or concrete as structural material.

(c) Sketch various types of rolled steel sections and show their conventional axes.

(d) Draw a stress strain curve for mild steel and discuss salient points on it.

(e) List various loads which are considered in design and discuss any two.

(f) Discuss various limit states which are considered in design.

2. Attempt any **two** of the following : **(10×2=20)**

(a) A tie member of a truss consists of double angle section, each 80 mm × 80 mm × 8 mm welded on the opposite side of a 12 mm thick gusset plate at lower and upper side of the angle by 5 mm fillet weld in the workshop. Determine the length of welds at lower and upper side of angle if factored tensile load in the member is 300 kN.

(b) Determine the strength and efficiency of the lap joint shown in following Fig. 1. The bolts are of 20 mm diameter and of grade 4.6. The two plates to be joined are 10 mm and 12 mm thick of grade Fe-410.

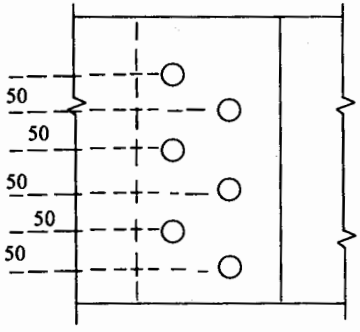

Fig. 1

(c) Discuss the following :

(i) Prying action

(ii) Advantages of fillet weld over butt weld

(iii) Comparison of welded joints with bolted joints.

3. Attempt any **two** of the following : **(10×2=20)**

(a) Find tension carrying capacity of single angle ISA 100 × 100 × 8 mm connected to gusset by three bolts of 22 mm

diameter at pitch of 80 mm c/c in one line as shown in fig. 2. Take $f_y = 250$ MPa and $f_u = 410$ MPa.

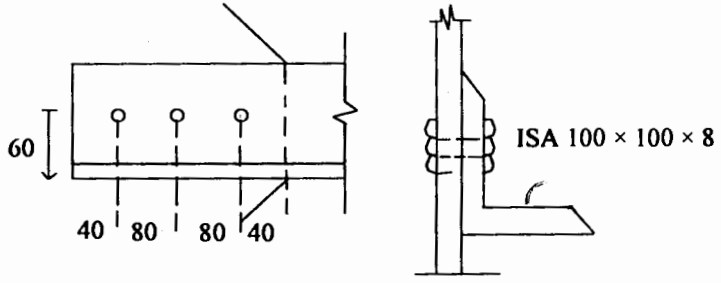

Fig. 2

(b) Determine the design tensile strength of plate 200 mm × 8 mm connected to 10 mm thick gusset using 20 mm bolts as shown in Fig. 3. Take $f_y = 250$ MPa and $f_u = 410$ MPa.

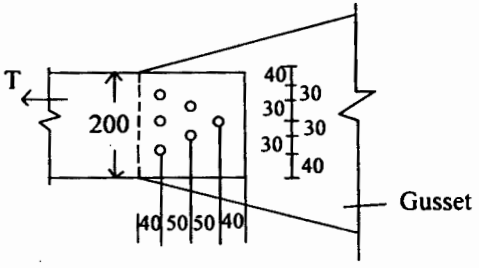

Fig. 3

(c) Design a suitable angle section to carry tensile force of 250 kN. Use welded connection. 10

4. Attempt any **two** of the following : **(10×2=20)**

(a) Calculate the design compressive load for a column made up of ISHB 350 @ 710.2 N/m and 3.5 m high. The column is restrained in direction and position at both the ends. Use steel of grade Fe-410.

(b) A built up column is 10 m long and carrying a factored load 1080 kN. The column consists of 2 ISMC @ 351.2 N/m placed back to back at a distance of 185 mm. Design single lacing system.

(c) Design a slab base for a column ISHB 350 @ 710.2 N/m subjected to a factored axial load of 1500 kN. The column end and base is machined and grade of concrete used is M-20.

5. Attempt any **two** of the following : **(10×2=20)**

(a) Design a simply supported beam of span 4.2 m carrying a reinforced concrete floor in which top compression flange is embedded. Beam is carrying 20 kN/m dead load and 20 kN/m imposed load. Assume Fe 410 grade steel.

(b) Design a simply supported beam of span 5 m to carry total load of 50 kN/m. The beam is laterally unsupported. Take $f_y = 250$ MPa.

(c) Explain the following :

(i) Local and lateral buckling of beam

(ii) Checks required for beam design.