CRASH COURSE

USN | | | | | | | | | | |

10CV72

Seventh Semester B.E. Degree Examination, May 2017
Design of Steel Structures

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting atleast TWO questions from each part.*
2. Use of IS800 and Steel tables are permitted.

PART – A

1 a. State the limit state design principles. Mention the limit states. **(06 Marks)**

b. List the different types of loads to be considered in structural steel design. Explain the steps to determine wind load. **(08 Marks)**

c. What are rolled steel sections? Mention commonly used structural steel shapes used as structural elements with sketches. **(06 Marks)**

2 a. Mention the different types of bolts used to connect the steel structural elements. **(02 Marks)**

b. Explain with neat sketches working principles of HSFG bolts. **(04 Marks)**

c. A bracket plate 12 mm thick is to be bolted to the flange of column ISHB 350@710.2 N/m by means of close tolerance and turned bolts. M20 bolts of grade 4.6 are arranged in two vertical rows 100 mm apart at a pitch of 70 mm. Design a bracket connection if the bracket plate carries a load of 120 kN at a lever arm of 250 mm. **(14 Marks)**

3 a. With a neat sketch of fillet weld, explain the terms size of weld and effective throat thickness. Give relevant specification for it. **(06 Marks)**

b. A tie member consist of 2 ISA 150×115×10mm. The angles are connected to either side of a 10 mm gusset plate and the member is subjected to a load of 350 kN (Tension). Design the welded connections assuming that connections are made in workshop. **(06 Marks)**

c. For the plate bracket shown in Fig.Q3(c), determine the size of weld. **(08 Marks)**

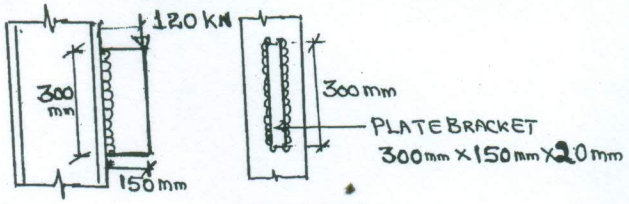

Fig.Q3(c)

4 a. Explain the following terms with reference to plastic analysis of steel structures:
(i) Shape factor (ii) Mechanism. **(03 Marks)**

b. Find the shape factor and plastic moment capacity for flat 60 F10 placed vertically as cantilever. **(05 Marks)**

c. Analyse the continuous beam shown in Fig.Q4(c). Calculate the maximum plastic moment. Take load factor as 1.50 **(12 Marks)**

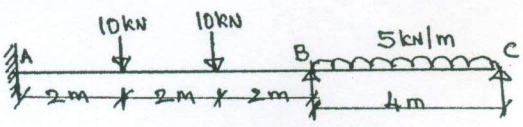

Fig.Q4(c)

PART – B

5 a. A plate 120mm × 8mm is connected to a 12 mm thick gusset plate by 6 nos. of M16 bolts of grade 4.60 distributed in two rows. Gauge and pitch distance = 60 mm. Edge distance = 30mm. Determine the design tensile strength of plate. **(08 Marks)**

b. Design a suitable unequal single angle section to carry a load of 150 kN (Tension) assuming a single row of M_{20} bolts of grade 4.6 for the end connection. Assume Fe410 grade steel. The length of the member is 2.50m. **(12 Marks)**

6 a. Determine design compressive strength of 2 angles 1SA 70×70×6 mm connected to both the sides of gusset plate using 2 bolts in a row. The angles are tack bolted along a length of 2.50m and are discontinuous members. **(05 Marks)**

b. Design a battened column consisting of 2 channel sections back to back subjected to a load of 1080 kN. Length of column is 5.5 m. The column is restrained in position but not in direction at both the ends. **(15 Marks)**

7 a. Distinguish between slab base and gusseted base. **(03 Marks)**

b. Explain briefly steps involved while designing gusseted base. **(07 Marks)**

c. Design a slab base for an ISHB 200@ 361.99 N/m. Load is transferred to base plate by welded connections. Load on column = 600 kN. Design the concrete pedestal using M_{20} grade concrete. SBC of soil = 180 kN/m^2. **(10 Marks)**

8 a. Design a laterally supported beam to carry a load of 20 kN/m. The effective span of simply supported beam is 6 m. Apply all necessary checks on design. **(15 Marks)**

b. Determine the design bending strength of ISLB 350@486 N/m, using appropriate tables of IS 800 – 2007. The beam is laterally unsupported and the unsupported length of beam is 4.3 m. Both the ends of compression flange are fully restrained against torsion and warping. **(05 Marks)**

* * * * *