Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech(CE-Old)/SEM-5/CE-505/2012-13

2012

STRUCTURAL DESIGN-II

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Use of IS-800.875 & SP6 (i) or Steel Table is Permitted.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

   i) The effective throat size of a fillet weld in conputing its strength is

      a) 0·707 times the size of weld

      b) function of angle of the hypotenuse

      c) equal to the size of fillet

      d) none of these.

   ii) The buckling load on a steel column is

      a) directly proportional to the slenderness ratio

      b) inversely proportional to the slenderness ratio

      c) linearly related to the length

      d) non-linearly related to the slenderness ratio.

iii) The allowable direct tensile stress in mild steel rolled sections is about (in MPa)

a) 120 b) 150

c) 180 d) 200.

iv) The area of cross section of single rolled section under tension to be considered for the calculation of the actual stress in design is

a) the gross area of cross section

b) the gross area less the area of rivet holes

c) the net effective area of cross section

d) modified area.

v) The average shear stress for rolled beams is calculated by dividing the shear force at the cross section by the

a) depth of beam b) web thickness

c) gross section of web d) width of flange.

vi) The angle of dispersion of load in web crippling is assumed as

a) 30˚ b) 45˚

c) 60˚ d) 90˚.

vii) In an eccentric riveted connection, maximum resultant force acts on

a) centre of gravity

b) critical section

c) critical rivet

d) edge of the bracket plate.

viii) The ratio l/r of lacing bars for compression members shall not exceed

a) 180 b) 150

c) 145 d) 120.

ix) In gantry girder the lateral force is resisted by

a) compression flange

b) compression flange and web

c) whole section

d) web only.

x) The maximum deflection of gantry girder under dead load and imposed load for EOT crane up to 50 ton is

a) L/500 b) L/750

c) L/1000 d) L/600.

where L = span of the crane runaway girder.

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. A riveted steel bracket connection has 22 mm diameter power driven shop rivets in two vertical rows with 6 rivets in each row. Pitch of the rivets = 80 mm, Gauge distance = 100 mm, Thickness of flange = 6 mm, Thickness of bracket plate = 8 mm. Determine the safe load P so that allowable stress in the extremely loaded rivet is just reached. Adopt working stresses as per relevant I.S. code.

3. Design a suitable fillet weld to connect a tie bar 60 mm × 8 mm to a 12 mm thick gusset plate. The permissible stresses in the tie bar and fillet weld are 150 MPa and 108 MPa respectively.

4. A tension member carrying a load of 100 kN is to be connected to a gusset plate. Diameter of rivet is to be used as 16 mm. Design the member and the joint.

5. A single angle strut ISA 75 mm × 75 mm × 8 mm of a roof truss is 1.5 m long. It is connected by two rivets at each end. Determine the safe load.

6. Design the concrete base for a column carrying an axial load of 3500 kN. Size of the base plate is 1000 mm × 1000 mm × 75 mm. Safe bearing capacity of soil is 250 kN/m^2.

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. Design a tension member using two rolled-steel angle sections connected on the same side of the gusset plate by power driven shop rivets to carry a tensile load of 160 kN. Design the riveted connection. If the angles are connected on both sides of the gusset plate, how will be the design affected ?

8. Design a built-up column of effective length 6 m carrying an axial load of 900 kN. Design using either by lacing bars or battens.

9. Design a beam of 5 m effective span, carrying a uniform load of 20 kN/m if the compression flange is laterally unsupported. Assume $f_y = 250$ N/mm^2.

10. A simply supported plate girder of span 8 m is subjected to a U.D.L. of 100 kN/m including its own weight. The top flange of the girder is restrained effectively and vertical stiffener are provided. Design the plate girder at centre of span.