* R N - 6 7 5 1 / 2 0 0 *

RN-6751

B. E. - III (Sem. V) (Civil) Examination

May / June – 2010

Structural Design & Drawing - I

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. - 3 (Sem. 5) (Civil)**

Name of the Subject :

☛ **Structural Design & Drawing - I**

☛ Subject Code No. : **6 7 5 1** ☛ Section No. (1, 2,.....) : **1&2**

Seat No. :

Student's Signature

(2) Assume necessary data wherever required and mention them clearly.
(3) Programmable calculator is not permitted
(4) IS 800, 808, 875 (I, II, III) and steel table are permitted.
(5) Use separate answer book for each section.

SECTION - I

1 Design a steel roof truss for the following data : **20**

(i) Span of truss = 16 m
(ii) Type of truss = Howe type (8 panels)
(iii) Roof covering = corrugated A.C. sheets
(iv) Spacing of roof truss = 4 m
(v) Rise of truss = 4 m
(vi) Location of truss at Surat
(vii) The building has 10% opening in walls
(viii) The life of structure is 50 years.
(ix) The structure is in open terrain with no obstructions.
(x) The size of building is 20 m × 10 m and height at eves level is 12m.

Calculate dead load, live load and wind load per panel point and design purlin.

2 Design a laced column with two channels placed back to back to carry a factored axial load of 1100 kN. The column is 9 m long and restrained in position but not in direction. Provide single lacing system with bolted connections. **10**

OR

2 Design the slab base for a column ISHB 300 carrying a factored axial load of 1800 kN safe bearing capacity of the soil is 200 kN/m^2. Permissible compressive stress of concrete is 4N/mm^2. Draw a neat sketch of plan and sectional elevation.

3 Attempt any **two** :

(i) A single unequal angle 100 × 75 × 6 is connected to a 10 mm thick gusset plate at the ends with 6 nos of 16 mm diameter bolts. The pitch and edge distance of bolts are 40 mm. **10**

Determine the design tensile strength of the angle assuming yield and ultimate stress of steel as 250 MPa and 410 MPa. The gusset is connected to 100 mm leg.

(ii) Design a suitable angle section to carry a factored tensile force of 210 kN assuming a single row of 20 mm diameter bolts. Assume design strength as 250 MPa. **10**

(iii) A tie member of a truss consists of an angle section ISA 65 × 65 × 6 of Fe410 grade. It is welded to a 8 mm gusset plate, design a welding on three sides to transmit a load equal to full strength of the member. Assuming shop welding and size of weld 4 mm. **10**

SECTION - II

4 (a) Match the followng :

(i)	Modulus of elasticity (E)	0.769×10^5 MPa
(ii)	Modulus of rigidity (G)	2×10^5 MPa
(iii)	Poisson's ratio (μ)	
	(a) Elastic range	0.5
	(b) Plastic range	0.3

(iv) Unit mass of steel 78.5 kN/m^3

(v) Coefficient of thermal expansion 1530°C

(vi) Brinell hardness number 150-190

(vii) Rockwell hardness number 157-190

(viii) Approximate melting point 12×10^{-6}/°C

(b) Intermediate traverse stiffness are provided **1**

(i) For aesthetic purpose

(ii) Where concentrated loads are acting

(iii) To improve the buckling strength of a slender web

(iv) To resist the uniformly distributed load.

(c) Horizontal stiffners are provided in plate girder **1**

(i) For carrying external uniformly distributed load

(ii) For resisting the buckling of web due to compressive forces

(iii) For aesthetic purpose

(iv) For carrying the concentrated load

5 (a) A cantilever beam is fixed to concrete wall. It supports a dead load of 25 kN/m and live load of 10 kN/m. The length of beam is 6 m. Select a suitable section with necessary checks. Assume stiff bearing length of 100 mm. **10**

(b) Design a laterally unrestrained beam to carry a uniformly distributed load of 60 kN/m. The beam is unsupported for a length of 2 m and is simply placed on longitudinal beams at its ends. **10**

Assume λ = 100 and $\frac{h}{tf} = 25$.

6 Design a gantry girder without lateral restraint along its span to be used in industrial building for the following data : **20**

C/C distance between the columns = 6 m

Crane capacity = 100 kN

Self weight of the crane girder excluding trolley = 150 kN

Self weight of trolley, electrical motor, hook, etc. = 30 kN

Minimum hook approach = 1m

Distance between wheel centres = 2m

C/C distance between gantry rails = 15 m

Self weight of rail section = 300 N/m

Yield stress of steel = 250 MPa.

OR

6 Design the welded plate girder for an effective span of 30 m and carrying a uniformly distributed load of 30 kN/m and two concentrated load of 150 kN each acting at 10 m from both ends. The girder is simply supported at ends. It is fully restrained at both ends against lateral buckling throughout the span. **20**

Load factor = 1.5, yield stress of steel f_y = 250 MPa.