Student Exam No._____

GANPAT UNIVERSITY

B. Tech. 6th Semester Civil Engineering

Regular Examination April – June 2016

2CI601 Design of Steel Structures

Time: 3 Hours

Total Marks: 70

Instruction: 1. All questions are compulsory.
2. Assume suitable data wherever it is necessary.
3. Figure to the right indicates full marks.
4. IS800:2007, IS875:1987 Part-I, II, III are allowed.

Section - I

Que. – 1   Design Bolted Plate girder for effective span of 15m to carry two   12
concentrated factored load of 500kN each at distance 5m from end
along with factored UDL of 40kN/m. The girder is laterally supported.
Perform following checks:
a) Moment capacity of flange
b) Shear capacity of web using post critical method.

OR

Que. – 1   Design Welded Plate girder for effective span of 18m to carry two   12
concentrated factored load of 150kN each at distance 8m from end
along with DL and LL of 15kN/m and 20kN/m respectively. Design
Unstiffened Plate girder with thick web. Perform following checks:
a) Moment capacity of flange
b) Shear capacity of web using post critical method.

Que. –2   (A)   Calculate Optimum depth of Plate girder Subjected to maximum   04
Bending moment 5000kNm. Assume Intermediate transverse stiffener is
not required. F_y=250Mpa

(B)   Design Gantry Girder for following data: 08
Crane Capacity = 180kN
Self weight of crane excluding trolley = 200kN
Span of crane = 10m
Span of Gantry = 6m
Self weight of trolley = 50kN
Self weight of rail section = 0.32 kN/m
Min. hook approach = 1.2m.
Wheel base of crane = 3.5m.
Yield stress = 250MPa.
Do any two Check required in Gantry girder

OR

Que. –2   (A)   Calculate Optimum thickness of web of Plate girder Subjected to   04
maximum Bending moment 6000kNm. Assume Intermediate transverse
stiffener is not required. F_y=250Mpa

(B) Design Gantry Girder for following data:

Crane Capacity = 250kN

Self weight of crane excluding trolley = 250 kN

Span of crane = 12 m

Span of Gantry = 6.5 m

Self weight of trolley = 40 kN

Self weight of rail section = 0.32 kN/m

Min. hook approach = 1.2 m.

Wheel base of crane = 3.5 m.

Yield stress = 250MPa.

Do Check for shear for Rolled section of Gantry girder, if h = 900mm, t_w = 12 mm F_{yw} = 250 MPa, Vertical shear force (Vz)=500 kN

08

Que. --3 Determine Nature and Magnitude of each member of Howe type Roof Truss having a span of 9m with sloping at 30^0. The Center to Center spacing of Roof truss is 4m. The Height of Eaves is 6m. The Roofing material consists of GI Sheeting. The structure is situated in vicinity of Ahmadabad, giving risk coefficient K_1=1. It is a structure with closely spaced building with height up to 10m and greatest dimension less than 20m and width 6m terrain category III class A, Coefficient K_2=0.91, The topography factor=1. Assume normal permeability. Provide bolted joint. Assume 3 panel in each sloping length.

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Section – II

Que. – 4 Attempt following questions

(A) Design a bolted framed connection to connect an ISLB 350 @ 485.6N/m transmitting an end reaction of 450 kN to the web of ISMB 550 @ 1017.3 N/m. Use 20 mm diameter of bolts, steel is of grade Fe 410 and bolts are of grade 4.6.

06

(B) Design a seat connection for a factored beam end reaction of 110 kN. The beam section is ISMB 250 @ 365.9 N/m connected to the flange of column section ISHB 200 @ 365.9 N/m using bolted connection. Use 20 mm diameter of bolts, Steel is of grade Fe 410 and bolts are of grade 4.6.

06

OR

Que. – 4 Attempt following questions

(A) Design a bolted framed connection an ISMB 400 @ 604.3N/m is connected to the web of girder ISMB 550 @ 1017.3 N/m. The maximum end shear due to factored load is 250 kN. Use 20 mm diameter of bolts, steel is of grade Fe 410 and bolts are of grade 4.6.

06

(B) Design bracket connection for the factored load as shown in figure. Provide 22 mm diameter 4.6 grade bolts. **06**
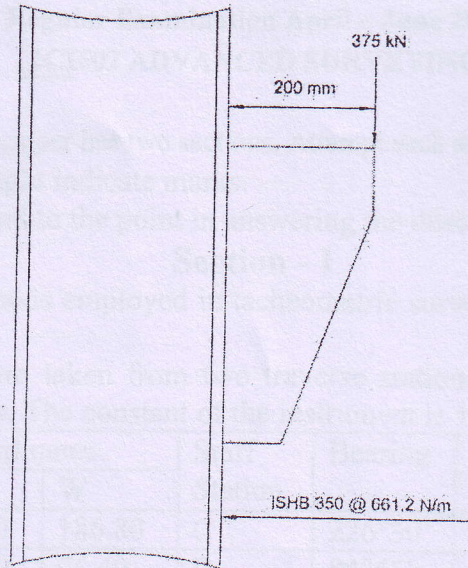
375 kN

200 mm

ISHB 350 @ 661.2 N/m

Que. – 5 **Attempt following questions**

(A) Design a Simply Supported beam of span 6m carrying working loads of DL=15 kN/m and LL=10 kN/m. Assume that the compression flange of beam is laterally unrestrained throughout. Do all the checks. **08**

(B) Explain the difference between bracket connection type-I and bracket connection type-II. **04**

OR

Que. – 5 **Attempt following questions**

(A) Design a Simply Supported beam of span 6m carrying working loads of DL=20kN/m and LL=10kN/m. Assume that the compression flange of beam is laterally restrained throughout. Do all the checks. **08**

(B) Explain the classification of connections according to Bjorhovde. **04**

Que. – 6 **Attempt following questions**

(A) Design bottom chord member of a roof truss for the following: Length: 4m, Compressive force: 150kN, Tensile force: 200kN **05**

(B) Design strut of a roof truss member for the following: Length: 1.5m, Compressive force: 120kN, Tensile force: 100kN **06**

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