PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
M.Tech. Winter 2017 - 18 Examination

Semester: 2   Date: 10/01/2018
Subject Code: 03209153 (old)   Time: 02:00pm to 04:30pm
Subject Name: Advanced Design of Steel Structures   Total Marks: 60

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 A) Design a gantry girder for a mill building to carry an electric overhead travelling crane having **(15)**
the following data:
1. Crane capacity : 270 kN
2. Weight of crane excluding crab: 210 N
3. Weight of crab: 65 kN
4. Span of crane between rails: 21 m
5. Minimum hook approach: 1.1 m
6. Wheel base:3.5 m
7. Span of gantry girder: 7 m
8. Mass of rail section: 30kg/m
9. Height of rail section: 75 mm , Take $fy = 250$ N/mm^2 and $E= 2 \times 10^5$ N/mm^2.

Q.2 Answer the following questions. (Attempt any three) (Each five mark) **(15)**
A) Explain the behavior of semi rigid connection.
B) Enlist the loads subjected on Transmission line tower.
C) Explain geometrical representation of yielding criteria.
D) Derive the stiffness matrix for a beam member with semi rigid end connections.

Q.3 A) A beam of uniform section 4 m long carried UDL of 60 kN/m. The end moments and span **(07)**
moments are equal. Determine the stiffness of end connection and end rotation.

B) Enlist the various checks required for design of gantry girder. **(08)**

OR

B) Give the classification of various types of structures which support the electric power transmission **(08)**
line.

Q.4 A) Explain the moment rotation curves for various types of steel connection with neat sketch of each **(07)**
connection.

OR

A) Explain the beam line method. **(07)**

B) An Industrial building of plan 15m×30m is to be constructed. Using plastic analysis, analyse the **(08)**
single span portal frame with gabled roof. The frame has a span of 15 m, the column height is 6m
and the rafter rise is 3 m and the frames are spaced at 5 m centre-to-centre. Purlins are provided
over the frames at 2.7 m c/c and support AC sheets. The dead load of the roof system including
sheets, purlins and fixtures is 0.4 kN/m^2 and the live load is 0.52 kN/m^2

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Instructions:
1. All questions are compulsory.
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4. Start new question on new page.

Q.1 Design a gantry girder for a mill building to carry an electric overhead travelling crane having the **(15)**
following data:
1. Crane capacity : 250 kN
2. Weight of crane excluding crab: 200 N
3. Weight of crab: 60 kN
4. Span of crane between rails: 20 m
5. Minimum hook approach: 1.1 m
6. Wheel base:3.4 m
7. Span of gantry girder: 7 m
8. Mass of rail section: 30kg/m
9. Height of rail section: 75 mm , Take fy = 250 N/mm^2 and E= 2 x10^5 N/mm^2.

Q.2 Answer the following questions. (Attempt any three)   **(15)**
A) Explain the behavior of semi rigid connection.
B) Explain Tresca and Mises criteria on yielding of metals.
C) Explain Bauschinger effect phenomena in plastic deformation.
D) Explain geometrical representation of yielding criteria.

Q.3 An Industrial building of plan 15m×30m is to be constructed. Using plastic analysis, analyse the   **(07)**
(A) single span portal frame with gabled roof. The frame has a span of 15 m, the column height is 6m
and the rafter rise is 3 m and the frames are spaced at 5 m centre-to-centre. Purlins are provided over
the frames at 2.7 m c/c and support AC sheets. The dead load of the roof system including sheets,
purlins and fixtures is 0.4 kN/m^2 and the live load is 0.52 kN/m^2

(B) Design suitable column section for above problem Q:3 (a)   **(08)**

OR

(B) Explain portal frame configuration and its analysis briefly.   **(08)**

Q.4
(A) Explain the beam line method.   **(07)**

OR

(A) Explain the moment rotation curves for various types of steel connection with neat sketch of each   **(07)**
connection.

(B) A single bay single storey portal frame carries UDL of 40 kN/m over its beam of 6 m long. The   **(08)**
rigidity of semi-rigid connection at either end of beam with the column is 80%. Determine the
design moments. The columns and beams have uniform cross sections.