Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII (NEW) - EXAMINATION – SUMMER 2017

Subject Code: 2180610 Date: 02/05/2017

Subject Name: Design of Steel Structures

Time: 10:30 AM to 01:30 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of IS: 800, IS: 875 and Steel Tables is permitted, provided that they do not contain anything other than the printed matter inside.**
5. **Consider f_y = 250 N/mm^2 and f_u = 410 N/mm^2.**

Q.1 **(a)** Explain various components of an industrial building with suitable sketches. Also, state the factors to be considered for the planning and site selection of an industrial building. **07**

(b) Design an unstiffened web angle bolted connection for a beam ISMB300 which transfers a factored end shear of 210 kN to the flange of a column ISHB350 (@67.4 kg/m). Consider M20 bolts of property class 4.6. **07**

Q.2 **(a)** Design a top chord member of N - type lattice bridge girder of 20 m span and width of deck as 3.5 m. Consider dead load of 5 kN/m^2, LL of 4 kN/m^2 and floor finish of 1 kN/m^2. Consider total 08 panels. **07**

(b) Explain the types, components and applications of truss girder bridges with necessary sketches. **07**

OR

(b) Explain the following connections with neat sketches: beam to beam web angle connection, beam to column flange seat angle connection, moment resistant beam to column connections. **07**

Q.3 Determine the nodal loads (per panel point load) for the howe roof truss of a workshop by considering dead load, live load and wind load. The workshop is situated in plain terrain at Delhi and it has total plan dimension of 20 m x 45 m. The truss has total 10 segments. Consider span of truss 20 m, spacing of truss as 4.5 m (c/c), pitch of truss as 1/6, height of building (upto bottom chord of truss) as 15 m, roof sheets of weight 120 N/m^2, 15 % of opening in wall area, design life for structure as 50 years and terrain with numerous closely spaced obstructions having the size of structures up to 8 m in height. Assume ISMC100 for purlin. Consider important load combinations and also calculate the uniformly distributed load on purlin based on critical load combination. **14**

OR

Q.3 **(a)** Enlist various components of Plate girder and Explain the tension field action. **07**

(b) Design a load carrying stiffener for a concentrated load of 500 kN for the plate girder section as follows: Web size = 15 mm x 1500 mm, Flange size = 650 mm x 25 mm. **07**

Q.4 Design a welded plate girder with vertical intermediate stiffeners using simple post critical method for span of 22 m. The girder is laterally restrained throughout and carrying uniformly distributed factored load of 120 kN/m (including self weight) over the entire span. Connections design and design of end bearing stiffener are not required. **14**

OR

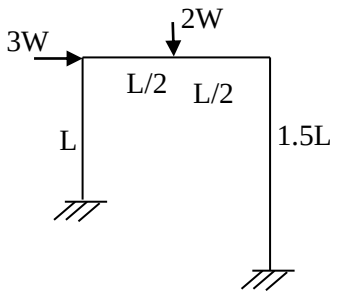
Q.4 Design a gantry girder considering following data: Crane capacity = 180 kN, self weight of crane girder = 180 kN, self weight of trolley = 30 kN distance between crane hook and the gantry girder = 1 m, wheel base = 3 m, c/c distance between gantry rails = 15 m, span of gantry girder = 6 m, self weight of rail section = 280 N/m, diameter of crane wheels = 125 mm. Checks for buckling and deflections are not required. Connections design is not required. **14**

Q.5 **(a)** What is stiffener angle? Write the detailed steps for design of the stiffened welded seat connection (subjected to moment due to shear). **07**

(b) A fixed beam of '2L' m in span, is subjected uniformly distributed load of 'W' on left half of beam. Determine the collapse load if beam has uniform cross-section. **07**

OR

Q.5 **(a)** Compute the collapse load in portal frame shown below, **07**



(b) Explain the hinge length and assumptions made in plastic analysis in detail. **07**

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