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GUJARAT TECHNOLOGICAL UNIVERSITY PDDC- SEMESTER- VI • EXAMINATION - SUMMER 2015

Subject Code: X60604 Subject Name: Structural Design -1 Time:10:30 am to 1:00 pm **Instructions:**

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- 4. Use of IS: 800-2007, IS:875 and STEEL TABLE are permitted.
- 07 0.1 (a) Explain different types of load to be considered in steel structure design. 07
 - Explain advantages and disadvantages of steel structure. **(b)**
- **Q.2** Explain limit state of serviceability as per IS code. (a)
 - An ISLB 300 @ 369.8 N/m transmit an end reaction of 385 kN under factored **(b)** 07 load, to the web of ISMB 450 @ 710.2 N/m. Design a suitable web cleat connection. The steel is of grade Fe 410 and bolts of grade 4.6.

OR

- (b) Design a stiffened seat connection for an ISMB 350 transmitting an end reaction 07 of 320 kN (due to factored load) to a column section ISHB 300. The steel is of grade Fe 410 and bolts of grade 4.6.
- Q.3 A gantry girder of 6 m span is to be designed for crane capacity of 250 kN. The 14 effective span of crane girder is 18 m. Weight of crane girder excluding crab is 150 kN and weight of crab is 50 kN. Take clearance as 1m and wheel base as 3.0 m. Choose suitable section and check the bending stresses and deflection.

OR

- A portal frame consists of two hinge supported column of 4 m height separated Q.3 14 by a beam of span 5 m and loaded up to collapse with downward uniformly distributed load of 10 kN/m and lateral point load of 30 kN at beam column junction . Find the plastic moment of resistance if it is of uniform strength.
- Q.4 Considering non-sway column in a building frame with flexible joints of 3.5 m 14 high and subjected to the factored axial load = 600 kN and factored moment = 30 kNm at top of column and 50 kNm at bottom of column, Design a suitable beam-column assuming $fy = 250 \text{ N/mm}^2$. Take the effective length of the column as 0.8L along both the axes.

OR

Q.4 Design only web and flange (with respective checks) of plate girder of span of 14 30 m subjected to factored load of 80 kN/m throughout and two factored point load of 400 kN acting at 10 m and 20 m from left support. In this plate girder transverse stiffener should be avoided. Use simple post critical method for checking of shear buckling of web. Assume $\mu = 0.3$, $E = 2 \times 10^5 \text{ N/mm}^2$, $f_v = 250$ MPa.

Date: 14 /5/ 2015

Total Marks: 70

07

Q.5 A foot over bridge is of span 24 m and pedestrian load of 5 kN/m². The clear 14 distance between two trusses is 3.5 m and truss height is 2.2 m. Take dead weight of truss is 1.5 kN/m. Flooring made up with RCC slab of 100 mm depth considering floor finish 1 kN/m². Assume suitable configurations of truss and design & detail a cross beam and a top chord near centre.

OR

Q.5 Roofing system of an industrial shed consists of trusses spaced at 4 m apart. The span of roof truss is 24 m and rise is 6 m. The level of eaves is 6 m above the ground. Assume suitable configuration of truss. Design one inclined member of principle rafter only. Choose suitable section for the inclined member no need to show any check. The shade is situated on flat terrain with sparsely populated buildings. The shed has less than 20 % permeability.
