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## **GUJARAT TECHNOLOGICAL UNIVERSITY** ME – SEMESTER II– EXAMINATION – WINTER - 2016

Subject Code: 2722007 Date: 19/11/2016 **Subject Name: Advanced Design of Steel Structures** Time: 2:30 pm to 5:00 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:801, IS:811, IS:875, IS:1893 and SP1/Steel Table is permitted. Q.1 Explain the cold form steel with its Advantages and Disadvantages. 07 **(a)** Explain important mechanical properties of steel with reference to various loads 07 **(b)** like static load, impact load and repeated load. What are the general requirements for plastic design? Explain them. 07 Q.2 **(a)** Determine the safe axial load capacity in Compression of light gauge channel **(b)** 07 (C) section shown in figure 1 with effective length 2.5 m. yield strength of steel is 240 MPa. Take thickness t= 4 mm, A= 1180 mm<sup>2</sup>,  $r_z$ =66.2 mm,  $r_y$ =17.8 mm,  $z_0$ =39.3 mm,  $J=0.616cm^4$ ,  $C_w=2540cm^6$ , x=14.9mm,  $G=80 \times 10^3 N/mm^2$ ,  $E=2 \times 10^5 N/mm^2$ , Iz= 518.0, iy= 37.5 OR Explain the different steps to be followed while designing a beam-column of 07 **(b)** Multistoried building. Q.3 Design a continuous beam ABCD using plastic approach with following data 14 (i) Span AB = 6m. Load= Two equidistant Point loads of 200kN. (ii) Span BC = 6 m. Load= udl of 50 kN/m (iii) Span CD = 6 m. Load= A single point load of 250 kN. Support A is fixed and supports B,C and D are hinged. Take Dead load factor =1.6 and shape factor 1.15 for (i) Provide uniform section throughout (ii) Provide the most economical section. OR Find the Collapse load for the frame of uniform cross section shown in figure 2 Q.3 14 under applied factored loads. Also, find the minimum section required to resist the applied loads. Design a suitable beam-column assuming fy=250 N/mm2 and effective length **Q.4** 14 of column as 0.8L along both the axes for (i) A factored axial load = 300 kN(ii) A factored bending moment =1000 kN m (iii) A factored shear force = 450 kN. OR **Q.4** Design a built-up laced column with four angles to support an axial load of 14 1000 kN. The column is 7.5 m long. Assume both the ends are held in position

and restrained against rotation. Assume Fe 410 grade steel.

Q.5 A pratt truss girder through bridge is provided for single broad gauge track. The effective span of bridge is 40 m (10 panels @ 4 m c/c). The cross-girders are spaced 4 m apart. The stringers are spaced 2 m c/c. 0.5 kN/m stock rails and 0.4 kN/m check rails are provided. Sleepers are spaced at 0.4m c/c and are of size 2.8m x 250mm x 250mm. The main girder s are provided at a spacing of 6m c/c. Height of truss is 6 m. Analyze the member force and design due to dead loads and Live + Impact loads in top and bottom chord member. For live load, EUDIL = 3500 kN for each track. CDA = 0.324.

## OR

Q.5 Roofing system of an industrial shed consists of trusses spaced at 5.0 m apart. 14 The span of roof truss is 25 m and rise is 5.0 m. The level of eaves is 7.0 m above the ground. Assume suitable configuration of truss. Design the purlin 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.

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