

GUJARAT TECHNOLOGICAL UNIVERSITYM. E. Sem. – IInd - Examination – June/July- 2011

Subject code: 1722007

Subject Name: Advanced Steel Structures

Date:29/06/2011

Time: 10:30 am – 01:00 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:875, IS:1893 and Steel Table is permitted.

- Q.1** Calculate design wind forces on a steel multi-storey building 60m tall and plan size 10mx20m to be constructed in Bombay. Assume average storey height to be 3.0m. The frames are to be spaced at 5m c/c in both directions **14**
- Q.2** (a) Using schematic diagram explain structural design process. **07**
 (b) Explain important mechanical properties of steel with reference to various loads like static load, impact load and repeated load. **07**
- OR**
- (b) Discuss about various loads to be taken for design of steel structures. Also discuss various load combination as per codal provisions and their importance. **07**
- Q.3** (a) Discuss briefly on rigid simple and semi-rigid connections. **02**
 (b) Design a header plate connection for a ISMB 300 beam to carry a reaction of 95 kN due to factored loads. The connection is to flange of a ISHC 200 column. Use fe410 grade steel ($f_y = 250$ MPa and M16 bolts of grade 4.6. **12**
- OR**
- Q.3** (a) List and explain various type of groove welds. **02**
 (b) Design a welded splice for an ISMB 300 section to transfer factored bending moment of 75 kN.m and a factored shear of 65 kN. Assume that the flange splice carries all moment and that the web splice carries only shear. **12**
- Q.4** A three equal span($L = 8$ m) continuous subjected to a total design load of 40 kN/m. Using plastic approach design continuous beam with (i) Single section without cover plates and (ii) Different sections with cover plates. Design stiffeners for lateral stability and twist. **14**
- OR**
- Q.4** Fix the basic dimension of warren truss for a through type truss girder bridge having following data to carry a single track BG loading. **14**
- (i) Effective span : 36m and C/C spacing of stringer : 1.9m
 - (ii) Sleeper and their spacing : 250mm x 150mm x 2.8m at 0.4m c/c
 - (iii) Density of timber 7.4 kN/m².
 - (iv) Weight of stock rails + guard rail + fastening etc : 1.02 kN/m
 - (v) Live load: total 805 kN for bending moment and 952 kN for shear force.
 - (vi) Impact load factor 1.683
- Design the stringers, which supports cross beams.
- Q.5** (a) When can a centenary cable be assumed as a parabola for the purpose of analysis? **02**
 (b) Determine the maximum force developed in the cable supported 60m apart with supports having equal elevation. The central sag of cable is 0.5m. The cable is subjected load from deck of suspension bridge equal to 10 kN/m UDL. Also design the cable using standard grade of steel. **12**
- OR**
- Q.5** A fixed based portal frame having bay width 5m and bay height 4m is subjected to Vertical UDL of 30 kN/m(↓) on beam and horizontal UDL of 20 kN/m (→) on left column. Using plastic approach design portal frame with (i) Single section for beam and columns and (ii) Different sections beam and columns. Design stiffeners for beam-column connection. **14**
