B. TECH. (SEM.VI)
UTU EXAMINATION, 2013-14
DESIGN OF STEEL ELEMENTS

Time: 3.00 Hours
[Total Marks: 100]

Note: (i) Attempt ALL questions.
(ii) All questions carry Equal marks.
(iii) In case of numerical problems assume data whenever not provided.

1. Attempt FOUR of the following. 5x4=20
   a) State advantages of steel structures
   b) State disadvantages of steel structures
   c) State four mechanical properties of structural steel
   d) State the function of purlins.
   e) Define: i) pitch, ii) edge distance, iii) end distance in bolted connections
   f) State three modes of failure of a bolted connection

2. Attempt TWO of the following. 10x2=20
   a) Write design procedure of splices in a tension member.
   b) An inclined truss member is made up of two ISA 125 x 75 x 10 connected back-to-back with longer leg connected to gusset plate 12 mm thick. Design a bolted connection to transfer a factored design force of 300 kN using 16 mm bolts.
   c) A connection between a double angle section 2 ISA 75 x 50 x 6 and gusset plate 8 mm thick consists of 6 bolts of 20 mm nominal diameter in a single line. Calculate maximum factored force the connection can resist.
3. Attempt TWO of the following.
   a) Write design procedure of batten in a compression member.
   b) Determine block shear strength of a tension member made up of single ISA 80 x 60 x 8 using 10 mm gusset plate with 9 bolts of diameter 16 mm @ 50 mm c/c, end clearance 30 mm and gauge distance as 40 mm.
   c) Calculate design tensile strength of a single angle section made up of ISA 90 x 90 x 6 with 8 mm gusset plate using 5 bolts of 16 mm diameter in a single line along the load. The bolts are pitched at 50 mm with end clearance of 30 mm and gauge distance of 40 mm.

4. Attempt TWO of the following.  
   a) Write design procedure of laterally supported and laterally unsupported beam.
   b) Determine load carrying capacity of a double angle compression member made up of 2 ISA 125 x 75 x 8 with an angle on either side of 10 mm gusset plate. Length of member is 3.5 m with both ends fixed.
   c) Check whether ISMB 450 is sufficient for flexure for a simply supported beam of span 4 m carrying load of 20 kN/m.

5. Attempt FOUR of the following.  
   a) Design a suitable slab base for an ISHB 500 to transfer a factored load of 1000 KN to foundation stratum having bearing capacity 400 kN/m². Assume concrete of grade M15. Draw the details.
   b) Calculate thickness of base plate of a slab base having ultimate upward soil pressure of 340 kN/m². Projections of plate beyond column faces are 95 mm and 85 mm.
   c) Write design procedure of slab base & gusset base.