

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VII (OLD) EXAMINATION – WINTER 2018****Subject Code: 170603****Date: 26/11/2018****Subject Name: Structural Design-I****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- 456-2000, IS: 800-2007 and Steel Table is permitted.
5. Use of SP-16(Design Aids) is NOT permitted.

- Q.1** (a) Explain in brief design philosophy of various methods of design. **07**
 (b) Draw neat and clean figures for beam to beam connection and beam to column connection in steel design. **07**
- Q.2** (a) Write the design steps for the RC combined footing. **07**
 (b) Sketch neatly the Design Stress and Strain Block Parameters and derive equation for Depth of Neutral Axis and Moment of Resistance for a balanced beam section. **07**
- OR**
- (b) Explain Strength, Serviceability, stiffness, stability and ductility in brief. **07**
- Q.3** (a) Explain one way shear check and two way shear check for footing design. **07**
 (b) Draw the neat sketches of Lacing system, Battening system for steel columns. **07**
- OR**
- Q.3** (a) A reinforced concrete beam of rectangular section 230 mm x 500 mm deep is reinforced with tensile and compressive reinforcement 4 nos. 20 mm dia. and 2 nos. 16 mm dia. at effective cover of 50 mm on both side respectively. Using concrete M20 and Fe250. Find moment of resistance of the beam. **07**
 (b) A circular column 300 mm dia. and 5.5 m height is effectively held in position and direction at one end only held in position at other end. Use minimum % of steel. Use M20 and Fe415. Find safe load of column. **07**
- Q.4** (a) Design a simply supported two way slab of a clear size 3 m x 4 m for a live load of 3 kN/m². The slab is supported on 250 mm wall. Assume corners are held down. Use M20 and Fe415. Perform all necessary checks and Sketch the reinforcement detailing. **14**
- OR**
- Q.4** (a) i) A R.C.C beam has C/S 300 mm x 600 mm and is subjected to BM=110 kN.m, SF=90 kN, TM=40 kN.m. Determine the equivalent bending moment and shear force for which the section is to be designed. **04**
 ii) Determine development length of 16 mm dia. bar in compression. Use M25 and Fe415. **03**
 (b) A two span continuous beam of each span length 8 m is loaded with DL = 10 kN/m and LL = 20 kN/m. Design the beam using plastic method. Take $f_y = 250$ N/mm². **07**
- Q.5** (a) Design suitable fillet weld to connect a tie plate 60 x 8 mm to a 12 mm thick gusset plate. The plate is subjected to load equal to full strength of member. Assume shop welding and Fe410. **07**
 (b) A Tension member in a roof truss is subjected to factored tensile load of 300 kN. Design the member using two angles on both side of gusset plate. Assume $f_y = 250$ MPa and 20 mm dia. bolt. **07**

OR

- Q.5 (a)** Calculate the compressive strength of a single angle strut ISA 100 x 75 x 10 mm with c/c length of 1.5 m. Angle is loaded through one leg and ends are fixed. Consider 1 bolt at each end. Take $f_y = 250$ MPa. **07**
- (b)** Calculate the moment carrying capacity of laterally unrestrained beam ISMB 350 of 3 m long. It has full torsional restraint and no warping restraint. **07**
