Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII(OLD) • EXAMINATION – WINTER 2016

Subject Code: 170603 **Date: 23/11/2016**

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 SP-16 is not permitted**
5. **Use of IS : 456-2000, IS : 800-2007 and Steel Table is permitted**

Q.1 **(a)** Do as directed **07**

(i) Write minimum diameter and numbers of main reinforcement bars required for circular column section.

(ii) Define short column

(iii) Write meaning of 4.6 grade (class) bolt.

(iv) Give minimum vertical clear spacing required between main reinforcement bars in a beam when 25 mm diameter bars are used.

(v) Define slender section

(vi) Write meaning M and 20 in M20 concrete

(vii) Define lug angle

(b) Find moment of resistance of a beam section 250 mm wide x 500 mm (overall depth), reinforced with 4-16dia bars at tension face. Considering 30 mm clear cover. Material grades are M20 and fe415. **07**

Q.2 **(a)** Find the bolt value of M16 bolt (4.6 grade) in a butt connection of 12 mm plates when connected using (i) single plate (ii) double plate. **07**

(b) Enlist assumptions made in theory of limit state of collapse. Mention the type of limit state condition to be considered corresponding to (i) shear failure (ii) deflection (iii) compression failure (iv) vibration. **07**

OR

(b) Write advantages of bolted connections over riveted or welded connections. **07**

Q.3 **(a)** A RCC beam is to be design to carry working UDL 40 kN/m over an effective span of 5 m. Carry out flexure and shear design taking 250 mm width and considering singly reinforced section. Show the detailing of reinforcement in L/S and C/S. Use grade of concrete as M20 and that of steel Fe415. **07**

(b) Design and detail the weld connection to be done at site for a single angle ISA 75 x 75 x 6 mm to develop its full strength, when connected to a gusset plate of 8 mm thickness. **07**

OR

Q.3 **(a)** Design and detail continuous slab of an office floor having three equal spans with 3.6 m effective length. Consider live load of 4 kN/m^2.Use grade of concrete as M20 and that of steel as Fe415. **07**

(b) Find compressive strength of 2 ISA 80 x 80 x 8 mm placed on either side of 8 mm thick gusset plate.The length of member is 3 m and is effectively held in position at both ends but restrained against rotation at one end. Take fy=250 MPa. **07**

Q.4 **(a)** A steel column ISMB500 is loaded by the factored axial compressive load 1000kN. Design the suitable slab base foundation for the column if it is resting on the M20 grade of concrete. **07**

(b) Design two span continuous, laterally restrained beam shown in the fig.1 using plastic method. **07**

OR

Q.4 **(a)** Design a built up column section of industrial shed, using channel sections to carry working load of 1500 kN.Column has 6.0 m unsupported length and is effectively held in position at both the ends and restrained against rotation at base. Furnish the complete details including lacing/battening in plan and elevation. **14**

Q.5 **(a)** Design an RCC short axially loaded column to carry working load of 1250 kN.The un-supported length of a column is 2.5 m. and effective length is 2.0 m.Use grade of concrete as M20 and that of steel as Fe415. **07**

(b) A singly reinforced slab 120 mm thick is supported by T-beam spaced 3.5 m centre to centre. The depth and width of web are 600 mm and 250 mm respectively. The section is reinforced with 8 nos. 20 mm dia. HYSD bars in 2 layers. The effective span of beam is 3.60 m.Considering flanged section determine moment of resistance of the section. **07**

OR

Q.5 **(a)** An RCC beam section, 300mm wide x 600mm deep is reinforced by 5nos. of HYSD bars of 25mm dia. at tension face and 3 nos. of HYSD bars of 20 mm dia. at compression face. Find moment of resistance of the beam section considering 30 mm clear cover at both the faces. Consider grade of concrete as M20 and that of steel as Fe415. **07**

(b) Design and detail isolated footing for an axially loaded RCC column 400 x 400 mm in c/s and carrying 1200 kN working load. Take SBC of soil as 200 kN/m^2. **07**

****

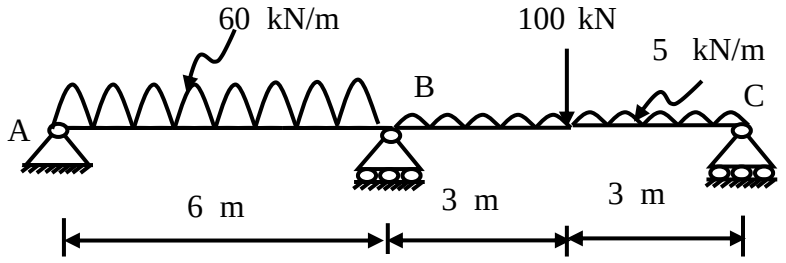

Fig.1 Q-4