Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (OLD) EXAMINATION – SUMMER 2019

Subject Code: 170603 **Date: 16/05/2019**

Subject Name:Structural Design-I

Time: 02:30 PM TO 05:30 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Draw neat sketch wherever necessary.**

Q.1 **(a)** Discuss the various philosophies of the design of R.C.C. and steel structures. **07**

(b) A simply supported R. C. C. beam of span 5m carries working udl of 30kN/m throughout the span. Design the beam for bending reinforcement only assuming the width of the beam as 230 mm, effective cover as 45 mm and main steel bars of dia. 20 mm. **07**

Q.2 **(a)** Write assumptions for the limit state of collapse in flexure. **07**

(b) (i) Calculate the effective flange width of an isolated T-beam having the effective span 6 m, actual width of flange 1000 mm, flange thickness 120mm and width of web 300 mm. **07**

(ii) Calculate effective depth of beam if overall depth of beam is 500 mm placed in moderate exposure condition. Diameter of stirrups and main reinforcement are 10mm and 20 mm respectively. Assume one layer of main reinforcement.

(iii) Calculate limiting moment of resistance of singly reinforced rectangular beam 200mm wide and 450 mm effective depth. Assume M20, Fe415.

OR

(b) Design a slab of size 3 m × 8 m is resting on wall of 230 mm thick. Assume Live Load = 3 kN/m^2. **07**

Q.3 **(a)** Design a doubly reinforced rectangular section for flexure. Beam is subjected to factored load of 70kN/m and having effective span of 4m. Size of beam is 230mm × 450 mm. Assume suitable data. Use M20, Fe 415 **07**

(b) Design a short braced column subjected to a factored axial load 2500 kN. Consider concrete of grade M30 and steel of grade Fe415. Sketch the reinforcement details. **07**

OR

Q.3 **(a)** Design an interior panel of flat slab of size 5m × 5m without providing drop and column head. Size of column is 500mm × 500mm and live load on the panel is 4kN/m^2. Take floor finishing load as 1kN/m^2. Use M25 concrete and Fe415 steel. **07**

(b) Design and detail isolated footing for the following data: **07**
Column section: 300mm × 450mm
Working Axial Load: 1000kN
SBC of Soil: 170kN/m^2
Use M20 and Fe415.

Q.4 **(a)** Design a lap joint to transfer a factored axial load of 250 kN between two plates of size 200mm × 10 mm and 200mm × 12 mm. Use Ordinary black bolts of 20 mm diameter and grade 4.6. **07**

(b) Design a single angle section to carry a factored axial tensile load of 150kN. The effective length of the member is 2.5m. Use Ordinary black bolts of 16 mm diameter and grade 4.6. **07**

OR

Q.4 **(a)** Design fillet weld between singe angle section ISA90×60×6mm with 8mm thick gusset plate to transfer factored axial load of 200 kN. **07**

(b) Determine the design load carrying capacity of a single angle section ISA50×30×5mm, which is used as a strut in a roof truss. It is connected to a gusset by two bolts. The center to enter distance between the end connections is 2 m. Assume load is concentric. **07**

Q.5 **(a)** Design a simply supported beam of span 6 m subjected to working load of 20kN/m. The compression flange of the beam is laterally restrained. Perform all necessary checks required. **07**

(b) Design suitable slab base for column ISHB 350 @ 0.710 kN/m carrying axial load of 2000 kN. Safe bearing capacity of soil is 180 kN/m^2 and grade of concrete is M20. **07**

OR

Q.5 **(a)** Write advantages and disadvantages of bolted and welded connections. **07**

(b) A column in a building frame is subjected to the following loads : **07**
Factored axial load = 600 kN,
Factored moment about z-z axis at top = 30 kNm
Factored moment about z-z axis at bottom = 50kNm (same nature as at top).
Length of column is 3.5 m, hinged at top and fixed at bottom. Design suitable beam-column.

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