SHANTILAL SHAH ENGINEERING COLLEGE, BHAVNAGAR
APPLIED MECHANICS DEPARTMENT

Assignment No: 01

Date: 27/12/2019

INTRODUCTION

Sub Code 2160607 Title of Subject **Elementary Structural Design**

#	Questions
1	Explain the purpose of Binding wires, Spacers, Chairs and Dowels from detailing point of view.
2	List down the criterion for the following along with the relevant Clause numbers in IS 456 : 2000 Maximum diameter of reinforcement bars, Maximum spacing of the bars and Minimum Reinforcement.
3	Elaborate with reasons for "Limit state method is more desirable than working stress method".
4	Explain Working stress method and Limit state method of structural Design Philosophy.

Name of Professor	Prof. D.P. Advani
Date of Submission	18/01/2020

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Assignment No: 02

Date: 20/01/2020

FLEXURE MEMBER - SINGLY REINFORCED BEAM

Sub Code 2160607 Title of Subject **Elementary Structural Design**

#	Questions
1	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.
2	Explain the modes of failure for Under- reinforced and Over- reinforced beam
3	Find the Moment of Resistance of a singly reinforced concrete beam of 230 mm width and 450 mm effective depth, reinforced with 4 bars of 12 mm diameter of Fe415 and M20 concrete. If span length is 3.5 m. find out safe working UDL on beam.
4	A reinforced concrete rectangular beam 325 mmx 650 mm deep is subjected to a uniformly distributed load 35 kN/m over a simply supported span of 6m. Design the beam for flexure using M:20 and Fe-415.
5	Design a rectangular beam having 3.5 m simply supported clear span. Assume support width to be 230 mm. Beam is subjected to a dead load of 15 kN/m and live load of 20.0 kN/m. Design the beam for M:20 and Fe-415 grade of materials.

Name of Professor	Prof. D.P. Advani
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Assignment No: 03

Date: 10/02/2020

FLEXURE MEMBER - DOUBLY REINFORCED BEAM

Sub Code 2160607 Title of Subject **Elementary Structural Design**

#	Questions
1	An R. C. C. beam of size 300 wide and 600 mm deep is reinforced by tension bars as 5 nos. of 25 mm diameter and compression bars as 3 nos. of 20 mm dia. Calculate the moment of resistance of beam if the clear cover is 25 mm on both the sides.
2	An R. C. C. beam of size 300 wide and 500 mm deep is reinforced by tension bars as 4 nos. of 25 mm dia. and compression bars as 2 nos. of 16 mm dia. Calculate the moment of resistance of beam if the clear cover is 30 mm on both the sides.
3	Design a Doubly R.C. beam of 300 mm X 600 mm overall size to resist a Factored moment 310 kNm. The effective cover is 50 mm for tensile and Compression steel. Use M:20 concrete and Fe-415 steel.
4	Design a doubly reinforced section for a rectangular beam having an effective span of 4.0 m. The superimposed load is 40 kN/m and size of beam is 230 mm X 450 mm. Assume the suitable data. Design for the M:25 and fe-415 grades of materials.

Name of Professor	Prof. D.P. Advani
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Assignment No: 04

Date: 12/02/2020

FLEXURE MEMBER – Tee BEAM

Sub Code 2160607 Title of Subject **Elementary Structural Design**

#	Questions
1	Calculate Moment of Resistance of a T beam of M:20 Concrete grade with following details: Df = 100 mm; d = 400 mm; bw = 300 mm; Ast = 4 – 16 mm dia, Fe-415 bars.
2	Find the Moment of Resistance of a T beam of M:15 Concrete grade with following details: Df = 110 mm; bf = 730 mm; d = 410 mm; bw = 230 mm; Ast = 4 – 20 mm dia. Fe-415 bars
3	An R. C. C. T-beam has breadth of flange as 1100 mm, thickness of flange 120 mm, effective depth 600 mm and width of web 230 mm. It is reinforced by 4 – 25 mm dia. bars. Calculate the ultimate moment of resistance for the same.
4	Design T beam for effective span of 4 m. It has to support concrete slab 120 mm thick with Live Load = 2 kN/m^2. Take spacing of beam 4 m, M:20 Grade concrete and Fe-415 Steel

Name of Professor	Prof. D.P. Advani
Date of Submission	20/02/2020

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Assignment No: 05

Date: 24/02/2020

SHEAR & DEVELOPMENT LENGTH DESIGN

Sub Code 2160607 Title of Subject **Elementary Structural Design**

#	Questions
1	A R. C. C. beam 250 mm X 450 mm effective is reinforced with 4 Nos - 20 mm diameter of Fe-415. The beam carries factored shear force of 200 KN. Find spacing of 8 mm diameter - 2 legged – Fe-250 stirrups. Use M:20.
2	A simply supported R. C. C. beam with clear span of 5 m, support width 230 mm, size of 230 wide and 420 mm deep, tension bars as 4 nos. of 16 mm dia. bars and clear cover of 25 mm. If it is loaded by an all inclusive factored U.D.L. of 60 kN/m, design the shear reinforcement near support only using 2 legged 6 mm mild steel stirrups.
3	A Simply R. C. C. beam of 300 mm X 500 mm overall size has 4 nos. 20 mm diameter bars of Fe-415 at an effective cover of 30 mm. The beam is subjected to Shear Force of 150 kN. Design the shear reinforcement. Use M-20 grade concrete & 8 mm diameter stirrups of Fe-250.
4	A simply supported R. C. C. beam 250 mm wide, 400 mm effective depth is subjected to Ultimate Shear Vu of 150 kN at supports. Tensile reinforcement at supports is 0.5%. Design shear stirrups near supports and also design nominal shear reinforcement at mid span for M:15 concrete and Fe-250 steel for stirrups.
5	A simply supported normal T - beam of 4.5 m clear span is loaded with characteristic load of 40 KN/m. it is reinforced with 4 no. 20 mm diameter bars at support. The section of the beam is 230 mm wide and 560 mm effective depth. Design the shear reinforcement at support. Use M:20 and Fe-415.
6	A simply supported reinforced concrete beam of size 300 mm X 500 mm effective is reinforced with 4 bars of 16 mm dia HYSD steel of grade Fe-415. Determine the anchorage length of the bars at the simply supported end if it is subjected to a factored shear force of 350 kN at the centre of 300 mm wide

Name of Professor	Prof. D.P. Advani
Date of Submission	28/02/2020

Assignment No: 06

Date: 02/03/2020

SLAB DESIGN – ONE WAY

Sub Code 2160607 Title of Subject **Elementary Structural Design**

#	Questions
1	Distinguish clearly between One way and Two way slab
2	What is meant by Aspect Ratio. State the limits of the same for One way and two way slabs. Also show the sharing of the loads on the adjacent beams of both the slabs by sketch.
3	Design a simply supported one way R. C. C. slab with clear span of 3 m X 7 m. Assume the live (Imposed) load as 4 kN/m^2 and floor finish load as 1 kN/m^2.
4	Design a one way simply supported slab for a room of 3.3 m X 9.6 m. the slab is resting on 230 mm thick wall. Take Live Load (L.L.) = 2.5 KN/m^2. Use M:20 grade concrete and Fe-415 steel. Check the slab for deflection. Show reinforcement details with a neat sketch.
5	Design a simply supported one way slab 3 m X 7 m supported on 200 mm wide beams. The slab carries a 2 kN/m^2 live load and 1.2 kN/m^2 finish load. Use M:20 concrete and Fe-415 steel. Check criteria for deflection and development length.

Name of Professor	Prof. D.P. Advani
Date of Submission	09/03/2020

Assignment No: 07

Date: 11/03/2020

SLAB DESIGN – TWO WAY

Sub Code 2160607 Title of Subject **Elementary Structural Design**

#	Questions
1	Design a Reinforced Concrete slab for a room 6 m X 5 m. The slab is to be cast monolithically over beams with corners held down. The width of supporting beams 230mm. Slab carries superimposed load of 3kN/m^2. Use M:20 and Fe-415.
2	Design a simply supported R. C. C. slab having clear span 4 m X 4 m rested on the 230 mm thick brick wall, subjected to live load of 3 KN/m^2 and floor finish 1 KN/m^2 for the corners held down condition. Provide detailed sketches. Checks are not required. Use M:20 and Fe-415.
3	An R. C. C. slab of spans 4 m X 6 m has only one long edge continuous and all other edges discontinuous. The slab is 130 mm thick. It is loaded by live load of 4 kN/m^2 and floor finish load of 1kN/m^2. Design main steel at bottom of 4 m span and check for deflection assuming support width of 230 mm.

Name of Professor	Prof. D.P. Advani
Date of Submission	17/03/2020

SHANTILAL SHAH ENGINEERING COLLEGE, BHAVNAGAR
APPLIED MECHANICS DEPARTMENT

Assignment No: 08

Date: 20/03/2020

DESIGN OF R. C. C. COLUMN

Sub Code 2160607 Title of Subject **Elementary Structural Design**

#	Questions
1	What is difference in behavior of short and long compression members?
2	Enumerate the difference between short and slender columns. State the code specifications for: a) Minimum eccentricity for design of columns; b) longitudinal reinforcement; c) lateral ties.
3	Calculate the area of steel required for a short R. C. C. column 400 mm X 450 mm to carry an axial load of 1100 kN. Use fck = 20 MPa and Fe-415 grade of steel.
4	A short column of 300 mm X 500 mm size is subjected to an axial factored load of 2000 kN and factored moments Mux = 80 kNm and Muy = 60 kNm. Determine the main reinforcement only in the column if the moment due to minimum eccentricity is less than the applied loads. Use M:20 and Fe-415 and 28 mm diameter bar.
5	Design a short rectangular column to carry an axial load of 455 KN. Take M:20 grade of concrete and Fe-415 grade of steel. Apply the check for the eccentricity. Unsupported length of column is 3 m.
6	A square R. C. C. column of size 450 mm X 450 mm has concrete grade of M:25 and main steel of 12 nos. of 20 mm dia. bars (Fe-500). It carries a factored axial load of 1600 kN and factored bending moments of 120 kNm and 60 kNm about two axes. Check the safety of the column if Uniaxial Bending Moment capacity about each axis is 180 kNm.
7	A short R. C. C. column of size 300 mm wide and 600 mm deep carries working axial compressive load of 800 kN. Design the column using 20 mm main steel bars and 8 mm tie bars. Assume the grade of the concrete as M:25
8	Design a short circular column with helical reinforcement column square to resist a factored axial load of 2400 KN. Provide all necessary checks and detailed sketch. Use M:25 and Fe-415.

Name of Professor	Prof. D. P. Advani
Date of Submission	31/03/2020

SHANTILAL SHAH ENGINEERING COLLEGE, BHAVNAGAR
APPLIED MECHANICS DEPARTMENT

Assignment No: 09
Date: 03/04/2020

DESIGN OF FOUNDATION

Sub Code 2160607 Title of Subject **Elementary Structural Design**

#	Questions
1	Write the design steps for the RC combined footing.
2	Explain one way shear check and two way shear check for footing design.
3	Design an isolated sloped footing for the column of size 300 mm X 500 mm reinforced with 6 bars of 20 mm diameter carrying an ultimate load of 900 kN. The bearing capacity of soil is 260 kN/m^2. Use M:20 and Fe-415. Effective cover for bottom steel is 60mm.
4	An R. C. C. column of the size 300 mm X 300 mm is loaded by a working axial compressive load of 700 kN. If the Safe Bearing capacity of the soil is 150 kN/m^2, design the suitable square slopped individual footing for the same giving check for the shear.
5	Design an isolated sloped footing for the column of size 300 mm X 400 mm reinforced with 8 bars of 16 mm diameter carrying an ultimate load of 1000 kN. The safe bearing capacity of soil is 180 kN/m^2. Assume effective cover for bottom steel is 60 mm.
6	An R. C. C. column of size 350 mm X 350 mm reinforced with 8 mm 16 mm diameter bars carries characteristic load of 800 kN. The allowable bearing pressure on soil is 200 kN/m^2. Design isolated pad footing. Use M:20 and Fe-415 for both column and footing. Carry out all checks. Draw detail reinforcement layout also. Assume 10% dead load of footing.

Name of Professor	Prof. D. P. Advani
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