C.U.SHAH UNIVERSITY Summer Examination-2017

Subject Name : Structural Design-I Subject Code :4TE07STD1

Semester : 7 Date : 21/03/2017 **Branch : B.Tech (Civil)** Time : 02:30 To 05:30

Marks:70

Instructions:

- (1) Use of Programmable calculator & any other electronic instrument is prohibited.
- (2) Instructions written on main answer book are strictly to be obeyed.
- (3) Draw neat diagrams and figures (if necessary) at right places.
- (4) Assume suitable data if needed.
- (5) IS 800:2007, IS 456:200, Steel Table and Sp-16 are allowed during the examination.

Q-1 Attempt the following questions:

(14)

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- Calculate the moment of resistant of the flange of T-Beam Having the size of 1 a) flange 150cm \times 15 cm & web Size is 30 cm \times 55 cm. if the characteristics strength of concrete is 15 N/mm².
- The maximum compression strain in concrete in axial compression is taken b) 1 as
- What percentage of the aggregates in contained in hardened mass of concrete? **c**)
- Write the Name of most important factor that affect the strength of a concrete. **d**)
- If the concrete characteristics Strength value is 55 N/mm², find its splitting **e**) strength of concrete.
- If f_v is the characteristics strength of steel and E_s = is the modulus of elasticity, the f) 1 strain in the tension reinforcement in the section at failure equals to
- The Permissible stress to which a structural member can be subjected to, is 1 g) known as

(i) Working stress (ii) tensile stress (iii) bearing Stress (iv) (ii) & (iii) both

- Allowable Working stress corresponding to the slenderness ratio of double angles 1 h) placed back to back and connected to one side of gusset plate, how much percentages can be reduced?
- The minimum pitch i.e., the distance between centers of rivet holes is not less **i**) than
- Give the Range between the angle of inclination of lacing bars with axis of the j) member.
- Why distribution steel is provided in RC Structure? 1 k) What is Development length? 1 D **m**) Give the minimum thickness in fillet weld. 1 Give the value of slenderness ratio for the tension member in which a reversal of n) 1
- direct stress occurs due to loads other than wind or seismic forces.



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| Q-2 | | Attempt all questions | (14) |
|------------|------------|---|------|
| | a) | A drawing room of a residential building measures $4.3m \times 6.55$ m. It is supported | 14 |
| | | on 350 mm thick walls on all four sides. The slab is simply supported at edges | |
| | | with no provision to resist torsion at corners. Design the slab using grade M-20 | |
| | | concrete and HYSD bar of Fe-415. | |
| Q-3 | | Attempt all questions | (14) |
| | a) | Design a simply supported steel beam of span 7m carrying R.C.C slab capable of | 14 |
| | | providing lateral restraint to the top compression flange. The beam is subjected to | |
| | | total u.d.l of 100 kN dead load excluding self weight plus 150kN imposed load. | |
| | | In addition, the beam carries a point load at mid span made up 50kN dead load | |
| | | and 50 kN imposed load. | |
| O-4 | | Attempt all questions | (14) |
| - | a) | Calculate the moment carrying capacity of a 3m long ISMB 350 beam which has | 7 |
| | , | full torsional restraint and no warping restraint at ends only. | |
| | b) | A Short R.C.C. column is to carry a factored load of 1900 kN. If the column is to | 7 |
| | , | be a square, design the column. Assume Minimum eccentricity is less than 0.05D. | |
| | | use M20 grade of concrete and Fe-250 grade of steel. | |
| 0-5 | | Attempt all questions | (14) |
| C | a) | Calculate the compressive strength of a single angle strut ISA $100 \times 75 \times 10$ mm | 7 |
| | , | with centre to centre length of 1.5 m. Angle is loaded through one leg and ends | |
| | | are fixed. Consider 1 bolt at the each end. Take $f_v = 250$ MPa. | |
| | b) | Determine area of tension reinforcement for T-beam to resist factored moment | 7 |
| | , | 300 kN.m. use M-20 and Fe-415 Steel. | |
| | | Flange Dimension = 1400×100 mm. | |
| | | width of web = 300 mm | |
| | | Effective Depth = 700 mm . | |
| O-6 | | Attempt all questions | (14) |
| C | a) | An angle section $90 \times 90 \times 8$ mm is to be connected to gusset plate by 6 mm fillet | 7 |
| | / | weld on sides and at the end of the member. The member is carrying tensile load | |
| | | of 120 kN. Design the welded connection. Assume Steel grade Fe 410 and fillet | |
| | | welding. | |
| | b) | A singly RC beam 250mm \times 500 mm is reinforced with 3 Nos . 20mm diameter | 7 |
| | , | bars at an effective cover of 30mm. Effective span of the beam is 4m. Find | |
| | | allowable superimposed load on the beam. | |
| 0-7 | | Attempt all questions | (14) |
| Ľ | a) | An RCC Column of size 350 mm \times 350 mm reinforced with 8 no.16 mm | 10 |
| | , | diameter carries a characteristic load of 800 kN. The allowable bearing pressure | |
| | | on soil is 200 kN/m ² . Design an isolated square pad footing. Use M20 and Fe 415 | |
| | | for both the column and footing. | |
| | b) | Explain the Limit state of Collapse in Flexure. | 4 |
| O-8 | - / | Attempt all questions | (14) |
| • | a) | 30kN/m u.d.l. is acting on a two sapn continuous beam. Each support is simply | 7 |
| | , | supported. Design the beam using plastic method. Take $fv = 250 \text{ N/mm}^2$. | |
| | b) | A simply supported rectangular beam of size $250 \text{mm} \times 500 \text{mm}$ effective depth is | 7 |
| | ÷ | reinforced with 4-18mm diameter M.S bars as tension reinforcement beam is | |

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subjected to factored shear force of 160 kN at support. Design the shear reinforcement with two bent up bars at 45° from steel and 8mm diameter M.S stirrups grade of concrete M-20.



