KATHMANDU UNIVERSITY
End Semester Examination
August, 2018

Marks Scored:

Level : B.E./B. Tech.
Year : III

Course : CIEG 310
Semester: II

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date AUG 27 2018

SECTION "A"
[20 Q. ×0.5 = 10 marks]

Encircle the appropriate box.

1. Lapped splices in tensile reinforcement are generally not used for bars of size larger than ___.
   [ ] 18 mm [ ] 25 mm [ ] 30 mm [ ] 36 mm

2. If A is the sectional area of a prestressed rectangular beam provided with a tendon prestressed by a force 'P' through its centroidal longitudinal axis, the compressive stress in concrete is _____.
   [ ] P/A [ ] A/P [ ] P/2A [ ] 2A/P

3. High strength concrete is used in prestressed member _____.
   [ ] To overcome high bearing stresses developed at the ends
   [ ] To overcome bursting stresses at the ends
   [ ] To provide high bond stresses
   [ ] All of the above

4. As a general rule the slope of pitch of a staircase should not be more than _____.
   [ ] 25° [ ] 38° [ ] 45° [ ] 55°

5. A foundation is classified as shallow foundation when depth of the foundation is _____.
   [ ] Less than its length [ ] equal or less than its width
   [ ] more than its length [ ] more than its width

6. The maximum strain in the tension reinforcement in the section at failure shall not beless than ___.
   [ ] $\frac{\sigma_y}{E_s}$ +0.02 [ ] $\frac{0.87\sigma_y}{E_s}$ [ ] $\frac{0.87\sigma_y}{E_s} + 0.002$ [ ] $\frac{0.87\sigma_y}{E_s} + 0.02$

7. The allowable axial load on a short RCC column with helical reinforcement is given by _____.
   [ ] $0.4\ \sigma_{ck}A_g + (0.67\ \sigma_y - 0.4\ \sigma_{ck})\ A_s$
   [ ] $0.446\ \sigma_{ck}A_g + (0.75\ \sigma_y - 0.446\ \sigma_{ck})\ A_s$
   [ ] $1.05\ times\ \{0.446\sigma_{ck}A_g + (0.75\ \sigma_y - 0.446\ \sigma_{ck})\ A_s\}$
   [ ] $1.05\ times\ \{0.4\sigma_{ck}A_g + (0.67\ \sigma_y - 0.4\ \sigma_{ck})\ A_s\}$

8. A singly reinforced concrete rectangular beam of overall depth 450 mm and effective cover 30 mm with Fe500 grade steel will be considered balanced section if the depth of neutral axis is _____ as per IS 456:2000.
   [ ] 201.6 mm [ ] 193.2 mm [ ] 222.6 mm [ ] 187.32 mm

9. According to the IS 456:2000, for a continuous beam of span 6000 mm, the minimum depth of beam preferred to be adopted would be _____ mm.
   [ ] 130 [ ] 235 [ ] 300 [ ] 858

10. In limit state design of concrete for doubly reinforced beam, if characteristic strength (σ_{ck}) of concrete is 30 MPa then the stress in the concrete at compression zone (σ_{cc}) will be ___ MPa.
[ ] 13.38 [ ] 8.92 [ ] 20.07 [ ] 10

11. In normal environment the crack widths should not exceed _____ mm.
[ ] 0.1 [ ] 0.03 [ ] 0.3 [ ] 3

12. As per IS 456:2000, the short term modulus of elasticity of M25 grade concrete in N/mm^2 can be assumed to be:
[ ] 27386.13 [ ] 22360 [ ] 28500 [ ] 25000

13. As per IS 456:2000, there may be _____ conditions for continuity or discontinuity of two way slabs with torsion at corners.
[ ] 8 [ ] 2 [ ] 4 [ ] 9

14. The stress-strain curve for concrete up to elastic yield point will be in the shape of _____.
[ ] zigzag line
[ ] nearly a straight line
[ ] parabolic line
[ ] semi-circular line

15. In flange beam design, when $(D_f/d) \leq 0.2$, then it is assumed:
[ ] that depth of rectangular portion of stress block is greater than that of the flange.
[ ] that depth of rectangular portion of stress block is less than that of the flange.
[ ] that depth of rectangular portion of stress block is equal to Y_f.
[ ] that the neutral axis lies in the web.

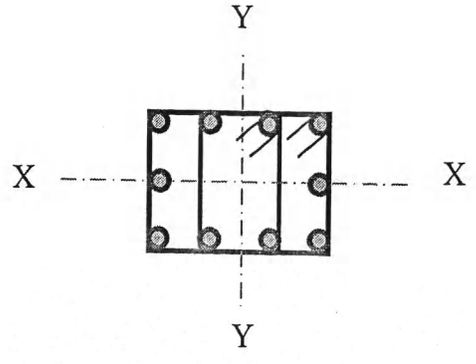
16. Flanged continuous beams are designed only for _____.
[ ] curved sections
[ ] steel with mild steel
[ ] support end moment
[ ] mid span moment

17. The side face reinforcement in beams is to be provided if the depth of web exceeds _____.
[ ] 500 mm [ ] 700 mm [ ] 750 mm [ ] 1000 mm

18. HYSD Steel area for distribution bars in a one way slab of overall depth 125 mm will be _____.
[ ] 187.5 mm^2 [ ] 150 mm^2 [ ] 120 mm^2 [ ] 1500 mm^2

19. The main reinforcement in RCC continuous beam is provided at _____.
[ ] top fibre
[ ] bottom fibre
[ ] Side fibre
[ ] top and bottom fibre

20. How many legs are provided along the Y-Y axis in the column shown in figure?
[ ] 2 [ ] 3 [ ] 4 [ ] 6



KATHMANDU UNIVERSITY
End Semester Examination
August, 2018

AUG 2 7 2018

Level : B.E./B. Tech.
Year : III
Time : 2 hrs. 30 mins.

Course : CIEG 310
Semester: II
F. M. : 40

SECTION "B"

- Candidates are required to give their answers in their own words as far as practicable.
- Use of Code IS 456:2000, Design Aid (SP16 for column and doubly reinf. beam) and IS 1343:1980 is allowed.
- Missing data may be assumed suitably. **Detail drawings should be provided wherever necessary.** All the designs are to be done in limit state method.

1. a) A **rectangular beam** section is 300 mm wide and 450 mm deep for a simply supported case. Tension steel provided is 4-16 ϕ. Find the position of the neutral axis, the lever arm, forces of compression and tension and the safe moment of resistance if the concrete grade is M20 and the steel grade is Fe415. [1+1+1+1+1=5]

b) A beam 250 × 350 mm of span 15 m is post tensioned with a **pre-stressing** force 1500 KN, at an eccentricity of 100 mm below the CG of beam. Determine loss of prestress due to Creep, elastic shorting and Shrinkage. Take M25 concrete. No of cables 7 with 6 mm dia. Creep coefficient = 1.5 and Fe415 steel. [5]

2. Design a reinforced concrete **column** 450 mm by 600 mm subjected to a service axial load of 1500 kN, and service moments of 120 kNm and 90 kNm about the longer and shorter dimensions respectively. Adopt M20 grade concrete and Fe415 grade steel. Lateral ties are NOT to be designed. [6]

OR

Calculate the **shear** resistance at section x-x and y-y of the given beam **(Fig. 1)** having width 300 mm and effective depth 450 mm. Take the grade of concrete as M20 and grade of stirrup steel as Fe250. Adopt Fe415 grade longitudinal steels. [6]

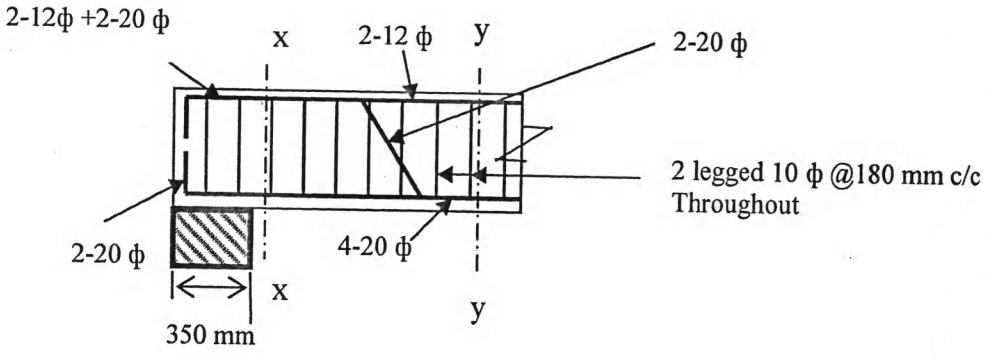


Fig. 1

3. A T-beam **(flanged)** RC floor system consists of 120 mm thick slab supported by beams of 3m center to center. The effective width and depth of web 300 m x 580 mm as shown **(Fig. 2)**. Main reinforcement consists of 8 bars-20 mm ϕ of Fe 415. The grade of concrete is M20. Find the moment of resistance of T beam if it is simply supported over a span of 3.6 m. [6]

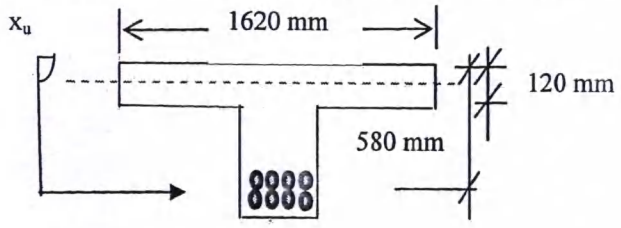


Fig. 2

4. Design a rectangular isolated **footing** of uniform thickness for RC column bearing a vertical load of 600 kN and having a base size of 400 × 600 mm. The safe bearing capacity of soil may be taken as 120 kN/m^2. Use M20 concrete and Fe415 steel. Check for one way and two way shear is compulsory. [6]

OR

Design a dog legged **stairs (Fig.3)** for an office building in a room measuring 2.8 x 5.8m clear. Vertical distance between the floor is 3.6 m. Width of flight is to be 1.25 m. Allow a live load of 3 kN/m^2. Use M20 concrete and Fe415 steel. Assume the stairs are supported by 230 mm thick walls at the end of outer edges of landing slabs. Checks are not required. [6]

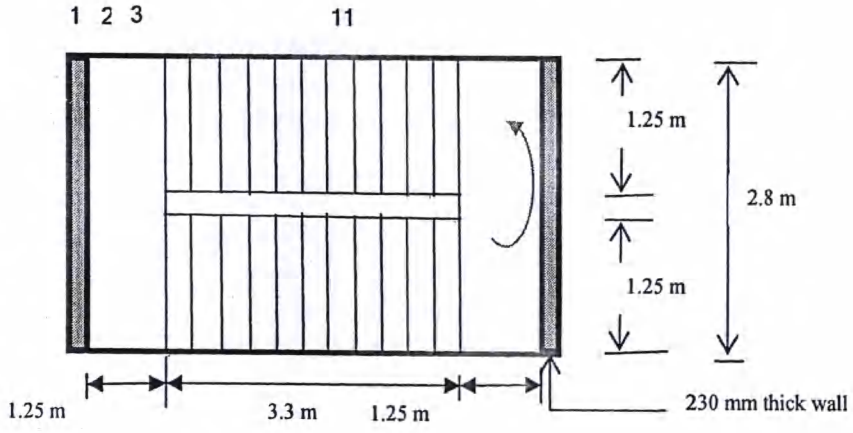


Fig. 3

5. Design a **doubly** reinforced rectangular beam simply supported at both the ends. The clear span between the supports is 5.6 m. The beam carries a service imposed load of 24 kN/m and superimposed dead load of 16 kN/m. Use M20 concrete and HYSD Steel of Fe415 for tension and compression reinforcement. [6]

6. Design a rectangular **slab** (supported on its all four edges) over a class room of size 4.8 m x 6.2 m. Two adjacent edges are discontinuous and the remaining two edges are continuous. A finishing surface of cement screed and punning of 20 mm shall be provided over the slab. The slab shall be used as a class room floor (adopt appropriate live load). Adopt M20 concrete and Fe415 steel. It is necessary to check for **deflection** of the slab. [6]