KATHMANDU UNIVERSITY
End Semester Examination [C]
April, 2023

Marks Scored:

Level : B.Arch.
Year : IV

Course : CIEG 431
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date : 06 APR 2023

Use of code IS 456:2000 & Design Aid SP 16 is not allowed in this section.

SECTION "A"
[20 Q. × 0.5 = 10 marks]

Encircle the most appropriate alternative from each set of choices.

1. If f_y is the yield stress of steel, then the design yield stress for a steel in limit state method is taken as:
   a. f_y b. $1.15f_y$ c. $0.87f_y$ d. $1.5f_y$

2. If 'R' is the resistance of structural elements and 'L' is the working loads then, which of the following is correct relation for Ultimate Load Design method:
   a. $\lambda R > L$ b. $R > \lambda L$ c. $R < \lambda L$ d. $\lambda R < L$

3. In limit state method, the maximum strain in tensile reinforcement at failure shall not be less than:
   a. $\frac{0.87f_y}{E_s} + 0.0035$ b. $\frac{f_y}{E_s} + 0.002$ c. $\frac{f_y}{E_s} + 0.0035$ d. $\frac{0.87f_y}{E_s} + 0.002$

4. The limiting Moment of Resistance, $M_{u,lim}$ of section with Fe500 grade steel is equal to:
   a. $0.133f_{ck}bd^2$ b. $0.138f_{ck}bd^2$ c. $0.148f_{ck}bd^2$ d. $0.152f_{ck}bd^2$

5. The main longitudinal bar in beam is provided primarily to resist:
   a. Shear force b. Torsion c. Bending moment d. Compression

6. Spacing of stirrups in a rectangular beam is:
   a. Kept constant throughout the length
   b. Decreased at the ends of beam
   c. Decreased towards the centre of the beam
   d. Increased at the ends of the beam

7. For a flanged beam, area of steel required as compared to rectangular beam is:
   a. Less b. Equal c. More d. Twice

8. According to IS 456:2000, the diameter of main bar in R.C.C. columns, shall not be less than:
   a. 16mm b. 12mm c. 10mm d. 8mm

9. According to IS 456:2000, maximum area of tension reinforcement to be provided in beam shall not exceed:
a. $0.4bD$ b. $0.04bD$ c. $0.004bD$ d. $0.0004bD$

10. In case of two way slab the load is carried mainly in:
a. Short span b. Long span c. Both spans d. Half of long span

11. Minimum area distribution steel per m width to be provided in slab of depth 100mm for Fe415 grade steel is:
a. 120 mm^2 b. 150 mm^2 c. 1200 mm^2 d. 1500 mm^2

12. Which of the following is **NOT** related to the limit state of collapse?
a. Flexure b. Deflection c. Compression d. Shear

13. If the area of footing is 5 m^2 and safe bearing capacity of soil is 100 kN/m^2, the safe load footing can carry is:
a. 250 kN b. 650 kN c. 750 kN d. 500 kN

14. If the footing fails in shear, then we should:
a. Increase the depth of footing
b. Decrease the area of footing
c. Decrease the depth of footing
d. Increase the area of footing

15. In a slab, 12mm bars are provided at a spacing of 200mm C/C. If it has to be replaced with 10mm bars, determine the spacing of bars required.
a. 119 mm b. 128 mm c. 139 mm d. 247 mm

16. Critical section for one-way shear in footing is taken from the face of column at a distance of:
a. d b. $d/4$ c. $d/2$ d. $2d$

17. For a circular column of unsupported length 3m and diameter 400mm, determine the minimum eccentricity to be considered in design.
a. 7.33 mm b. 10.8 mm c. 19.33 mm d. 25.8 mm

18. According to IS 456:2000, for a continuous beam having effective depth of 500mm, the maximum span to satisfy the vertical deflection is:
a. 7m b. 15m c. 13m d. 10m

19. In a footing of size 3m x 3m with a column size of 300mm x 300mm, if the effective depth of footing is 500mm, the perimeter of critical section for two-way shear is:
a. 3200 mm b. 4000 mm c. 2200 mm d. 5200 mm

20. If w_s is the self-weight of staircase slab on slope and θ is the angle between sloping slab and horizontal, then self-weight of slab on horizontal span is:
a. $w_s/\sin\theta$ b. $w_s/\cos\theta$ c. $w_s.\sin\theta$ d. $w_s.\cos\theta$

KATHMANDU UNIVERSITY

End Semester Examination [C]

April, 2023

06 APR 2023

Level : B.Arch.
Year : IV
Time : 2 hrs. 30 mins.

Course : CIEG 431
Semester : I
F.M. : 40

Make a suitable assumptions if necessary.
Use of code IS 456:2000 & Design Aid SP 16 is allowed.
Detail drawings should be done wherever required.

SECTION "B"

[6Q. × 4 = 24 marks]

Attempt *ANY SIX* questions.

1. Explain various modes of failure of reinforced concrete beams.

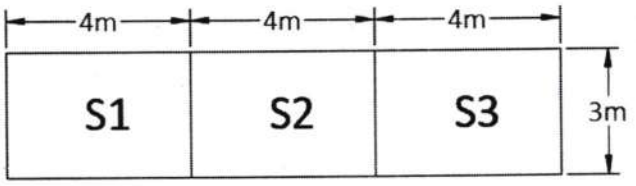
2. Design a rectangular beam for an effective span of 6m. The superimposed load is 60 kN/m and size of the beam is limited to 30 cm × 60 cm overall. Use M20 mix and Fe415 grade steel. Assume effective cover of 60mm.

3. A T-beam R.C. floor system consist of 120mm thick slab supported by beams at 3m center to center. The effective width and depth of web is 300mm x 580mm. Main reinforcement consist of 8 bars of 20mm diameter. The grade of concrete and steel used are M20 and Fe415 respectively. Determine the moment of resistance of the T beam, if it is used as simply supported beam of span 3.6m.

4. A column 4m long restrained in position and direction at both ends is subjected to an axial load of 1600 kN. Design a square column using M20 concrete and Fe415 steel.

5. A rectangular beam of size 300mm × 600mm is reinforced with 6 bars of 20mm diameters on tension side and 6 bars of 16mm diameter on compression side with Fe415 steel. The effective cover on both sides is 50mm and the effective span of the simply supported beam is 7.5m. Check whether depth provided is sufficient from the deflection consideration. Assume, exactly the required amount of steel is provided.

6. Figure below shows a slab system of a floor. Determine longitudinal reinforcements for the slab panel S1. Assume live load of 4 kN/m^2 and floor finish of 1 kN/m^2 Concrete of M20 grade and Fe415 HYSD bars are available for use.



7. A 250mm wide and 600mm deep R.C. beam is reinforced with 2 legged 10mm inclined stirrups at 250mm C/C with angle of inclination of 60°. Longitudinal steel consist of 4 bars of 20mm diameter with a cover of 40mm. If concrete grade is M25 and grade of steel is Fe415, determine the strength of the section in shear.

SECTION "C"

[2Q. × 8 = 16 marks]

Attempt *ALL* questions.

8. Design a square footing for a short axially loaded column of size 300mm × 300mm carrying a factored load of 900 kN. Use M20 concrete and Fe415 steel. Safe bearing capacity of soil is 180 kN/m^2.

9. A hall has clear dimension of 3m x 9m with wall thickness 230mm. The live load on the slab is 3 kN/m^2 and a finishing load of 1 kN/m^2 may be assumed. Using M20 grade concrete and Fe415 grade steel, design the slab.