

KATHMANDU UNIVERSITY  
End Semester Examination [C]  
December, 2024

Marks Scored:

Level : B.E.

Year : III

Exam Roll No. :

Time: 30 mins.

Registration No.:

Course : CIEG 310

Semester : II

F. M. : 10

Date 17 DEC 2024

*No any design code is allowed for this section.*

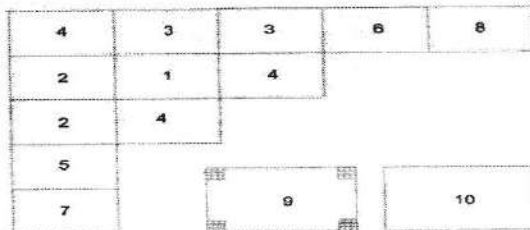
SECTION "A"

[20 Q.  $\times$  0.5 = 10 marks]

**Choose and encircle in the most appropriate option from each set of choices**

- Design methodology prevalent in use from the early 1900's until 1960' is
  - Limit state method
  - Performance based method
  - Load factor method
  - Working stress method
- Partial safety factors for loads under limit state of serviceability is
  - 1.5 DL + 1.5 LL
  - DL + 1.2 EL
  - DL + EL
  - DL LL + ELWhere DL, LL, EL are Dead Load, Live Load, Earthquake Load
- For Fe-415 steel, if the strain in steel is 0.0038, then the corresponding stress in the steel will be
  - $\sigma_y$
  - $\sigma_{ck}$
  - $0.87 \sigma_y$
  - $0.446 \sigma_{ck}$
- Limiting tensile steel in rectangular beam section for Fe 500 and M20 concrete is
  - 1.76%
  - 0.96%
  - 0.66%
  - 0.76%
- For the beam section with, M25, Fe 415, effective cover 40 mm, effective depth of 360 mm, effective width of 250 mm, tensile reinforcement are 3 No. of 16 mm diameter bar. The lever arm for the beam section is
  - 172.8 mm
  - 319.35 mm
  - 96.8 mm
  - 360 mm
- For the beam section with, critical value of NA depth is  $x_m = 212$  mm, effective cover to compression and tension rebar is 40 mm. The strain at the level of compression steel is
  - 0.0035
  - 0.0028
  - 0.0038
  - 0.002
- For the beam (M20 and Fe 415) having effective depth of 600 mm and actual depth of neutral axis 300 mm. The Section is
  - Under reinforced beam
  - Balanced beam
  - Over reinforced beam
  - Doubly reinforced beam
- Diagonal tension cracks in beam are normally
  - 45 degree with the horizontal
  - 90 degree with the horizontal
  - It is characterized by the crushing of concrete
  - Occurs under large bending moment

9. Design bond stress of mild steel is
- Decreases with increase in the grade of concrete
  - May be increased by 60% for deformed bar in tension
  - May be increased by 25% for deformed bar in tension
  - Is independent of type of steel and concrete
10. **CORRECT** Statement about the nominal cover is
- Nominal cover is higher for mild exposure condition than moderate exposure condition
  - For longitudinal bars in column nominal cover must be not less than 50 mm
  - For footings nominal cover shall be 50 mm
  - For slab nominal cover is generally higher than that of slab.
11. Basic value of span to effective depth ratio for continuous beam is
- 7
  - 20
  - 26
  - 10 divide by span length in meter
12. The transverse reinforcement for the torsion consists of rectangular closed stirrups placed perpendicular to the axis of the member. The spacing of the stirrups should be
- less than 300 mm
  - more than short dimeson of the stirrup
  - more than 0.25 times the sum of short dimension and long dimension of the stirrup
  - less than 0.75 times effective depth of the section
13. For the two way slab, the maximum moment for the S/S slab along minor direction is given by
- $M = \alpha_x w_u l_x^2$
  - $M = \alpha_y w_u l_y^2$
  - $M = \alpha_x w_u l_y^2$
  - $M = \alpha_y w_u l_x^2$
14. Slab panel shown by 2 is
- One long edge discontinuous
  - One short edge discontinuous
  - Interior panel
  - Three edge discontinuous and one short edge continuous



15. Slab panel shown by 9 is
- Four edges discontinuous with corners not held down
  - Four edges discontinuous with corners held down
  - Four edge continuous
  - Four edge discontinuous
16. For the square column, with unsupported length of 3000 mm, lateral dimension 400 mm. The minimum eccentricity should be
- 19.33 mm
  - 113.3 mm
  - 22 mm
  - 20 mm

17. If an increased load on the column on the strength of the helical reinforcement is allowed, its pitch should not exceed
- Least lateral dimension of the compression member
  - Sixteen times the smallest diameter of the longitudinal bar
  - 300 mm
  - 75 mm
18. The general non-dimensional equation for the load contour at a constant P may be expressed in the form:  $\left[\frac{M_{ux}}{M_{ux1}}\right]^{\alpha_n} + \left[\frac{M_{uy}}{M_{uy1}}\right]^{\alpha_n}$ , the value of the expression should be
- $\geq 1$
  - $\leq 1$
  - $\leq 2$
  - $\geq 2$
19. The permissible bearing stress on full area of concrete is given by
- $0.67 f_{ck}$
  - $0.45 f_{ck}$
  - $0.9 f_{ck}$
  - $0.87 f_{ck}$
20. Critical section for one way shear for isolated footing is at
- Distance d from the face of column
  - Distance 0.5d from the face of column
  - Face of column
  - At the center of the column



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F. M. : 40

*IS456:2000, IS 1343 (for prestressed concrete) and IS456-SP-16 is allowed to use.*

SECTION "B"

Attempt ALL questions. Assume suitable data if necessary.

1. **Design & Detail** a section of ring beam 50 cm wide and 70 cm deep subjected to a bending moment of 200 kNm, twisting moment of 15 kNm and a shear force of 150 kN at ultimate. Use M20 mix and Fe 415 grade steel. [7]
2. **Design & Detail** a simply supported rectangular beam for 5 meter effective span which is subjected to a dead load of 15 kN/m and live load of 12 kN/m. Use M25 Concrete and Fe 500 steel. [5]
3. **Design & Detail** a RC slab for a room measuring 5 m by 6 m size. The slab is simply supported on the all edges, with corners held down and carries a superimposed load of 3 kN/m<sup>2</sup>, inclusive of floor finishes etc. Use M20 concrete and Fe 415 steel. [8]
4. **Determine** the reinforcement for a short column for the following data: [6]
  - Column size 400 mm by 600 mm
  - $P_u = 2000$  kN
  - $M_{ux} = 160$  kNm and  $M_{uy} = 120$  kNm
  - Use M20 and Fe 415
  - Assume reinforcements are equally distributed on the all 4-sides
5. **Design & Detail** a square footing for a short axially loaded column of size 355 mm by 355 mm carrying 700 kN load. Use M20 and Fe 415. SBC of soil is 180 kN/m<sup>2</sup>. [8]
6. Illustrate the design process of Dog Legged Staircase as per IS 456:2000. Furthermore Detail rebar in longitudinal and transverse direction of any typical doglegged staircase. [6]

**OR**

Determine the moment of resistance of T-beam with the following details:

- $B_f = 740$  mm,  $d = 400$  mm,  $b_w = 240$  mm,  $D_f = 100$  mm
- M15 and Fe 250
- $A_{st} = 5 - 200$  mm  $\Phi$

