KATHMANDU UNIVERSITY
End Semester Examination
August/September, 2017

Mark 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 SEP: 10 2017

SECTION "A"
[20 Q. × 0.5 = 10 marks]

Mark "√" in the appropriate answer.

1. Working stress design assumes
[a] elastic stress-strain relation
[b] linear stress-strain relation
[c] elastic and linear stress strain relation
[d] isotropic material

2. The minimum grade of concrete mix to be used in RCC structural members is
[a] M20
[b] M15
[c] M10
[d] less than M10

3. In RCC beams, the tension reinforcement can be cut off at a point when it is no longer needed if
[a] enough bond length is available
[b] shear force is maximum
[c] bending moment is zero
[d] shear at cut off point does not exceed two third

4. Spacing of stirrups in a rectangular beam is
[a] kept constant throughout the length
[b] decreased towards the centre of the beam
[c] increased towards the end
[d] increased at the centre of the beam

5. The primary compression failure in RCC beam is caused in
[a] under reinforced beam
[b] balanced beam
[c] over reinforced beam
[d] all types of the beams

6. In a RCC continuous beam, main reinforcement is provided at
[a] top and bottom fibre
[b] top fibre
[c] bottom fibre
[d] side fibre

7. As per IS 456, side face reinforcement is provided in RCC beam when depth of the web in a beam exceeds
[a] 250 mm
[b] 500 mm
[c] 750 mm
[d] 1000 mm

8. The minimum thickness of the cover at the end of a reinforcing bar should be twice the diameter of the bar subjected to a minimum of
[a] 10mm [b] 12mm [c] 15mm [d] 25mm

9. Diagonal crack is introduced in a beam due to
[a] Bending moment
[b] Shear Force
[c] Bending moment and Shear Force
[d] Torsion

10. For a cantilever of effective depth of 50cm, the maximum span to satisfy vertical deflection limit is
[a] 3 m
[b] 3.5 m
[c] 4 m
[d] 4.5 m

11. The anchorage value of a standard hook is taken 16 times the diameter of the reinforcing bar, if the angle of the bend is equal to
[a] 30°
[b] 90°
[c] 120°
[d] 180°

12. If the unsupported length of the tower is 3.5m, then its effective length is
[a] 2.975 m
[b] 3.5 m
[c] 4.2 m
[d] 7 m

13. In a simply supported slab, alternate bars are curtailed at
[a] 1/4 of span
[b] 1/5 of span
[c] 1/6 of span
[d] 1/7 of span

14. The length of mesh of torsion reinforcement in slab is
[a] $1/4^{th}$ of shorter span
[b] $1/5^{th}$ of shorter span
[c] $1/4^{th}$ of longer span
[d] $1/5^{th}$ of longer span

15. The minimum number of 12mm diameter HYSD bars of Fe 415 required for a square RCC column having steel area of 1230 mm^2 is
[a] 10
[b] 11
[c] 12
[d] 16

16. A doglegged staircase supported on two opposite edges are designed as
[a] two way slab
[b] one way slab
[c] continuous slab
[d] restrained slab

17. In case of foundation of a rigid base, the distribution pressure on the soil is
[a] uniform
[b] maximum bending moment
[c] minimum in central zone
[d] maximum in central zone

18. In a prestressed member it is advisable to use
[a] low strength concrete only
[b] high strength concrete only
[c] low strength concrete but high tensile steel
[d] high strength concrete and high tensile steel

19. Prestressed concrete section uses
[a] HYSD bars
[b] Mild steel bars
[c] Rectangular strands
[d] Circular high yield strand

20. The live load generally considered for a public building as per IS 875 is
[a] 2 kN/m^2
[b] 3 kN/m^2
[c] 4 kN/m^2
[d] 5 kN/m^2

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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, IS 875, Design Aid (SP16) and IS 1343: 1980 is allowed. Missing data may be assumed suitably. Detail drawings should be done wherever required. All the designs are to be done in limit state method.

1. A reinforced concrete beam of a rectangular section of 300 mm width and 450 mm overall depth is reinforced with 6 bars of 16 mm diameter HYSD steel of grade Fe 415, placed at an effective cover of 40mm. Out of 6 bars, 2 bars have been bent up at 45 degree. Design the **shear** reinforcement if the beam is subjected to a factored UDL of 90 kN/m over a simply supported clear span of 5m. The concrete mix used is M20. [7]

2. A **restrained slab** S1 as shown in figure (Fig.1) is to be designed. Rectangular Beam of thickness 230 mm supports the slab as shown. The slab has to carry a live load of 3.5 kN/m^2 and floor finish and partition wall load of 1.25 kN/m^2. Use M 20 grade concrete and Fe 415 grade steel.

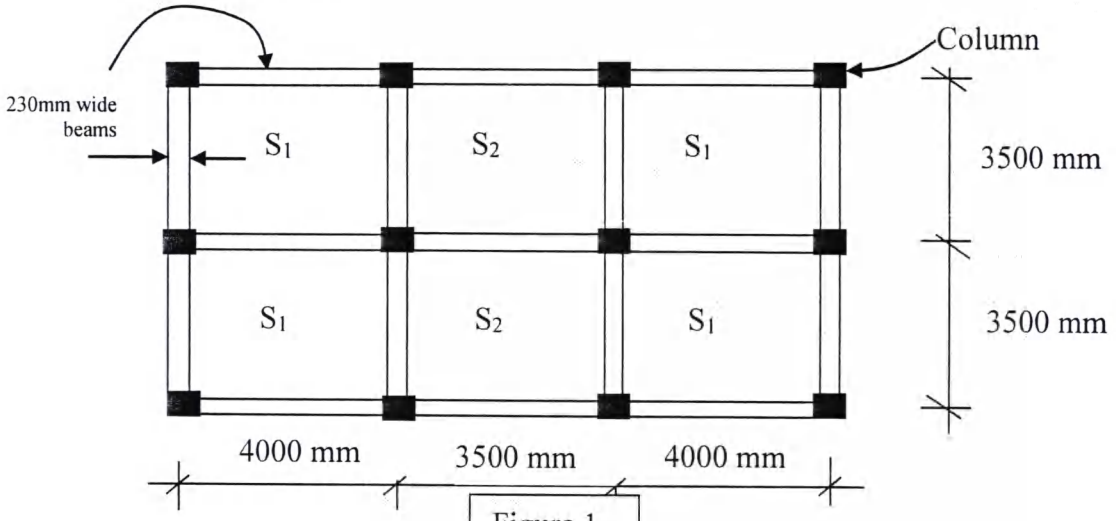

Figure 1

The followings are to be computed: a) moments, b) check for depth, c) area of steel and d) check for deflection. [2+1+2+2 = 7]

3. Design an isolated **footing** for a 400mm x 400mm column supporting service axial load 1200 kN. The net bearing capacity of the soil is 120kN/m^2. Use M20 grade concrete and Fe415 grade steel. The footing is also to be checked for one one way and two way shear. [3+4=7]

4. Design a short **column** subjected to biaxial bending located at lowermost storey of braced frame for the following data: [6]
Size of column = 450 mm × 400 mm
Concrete grade = M 25 and Steel grade = Fe 415
Factored axial load = 1300 kN
Factored moment acting parallel to larger dimension = 190 kNm
Factored moment acting parallel to shorter dimension = 110 kNm
The unsupported length of column is 3.5m.
It is also required to design the lateral ties.

5. Design the Doglegged type of **staircase** shown in Fig. 2. Landing slab A and Landing B are supported on beams along JP and MS respectively. The floor height is 3.2m. The finish loads and live loads are 0.6 kN/m^2 and 5 kN/m^2, respectively. Use Riser as 160 mm and Tread as 270 mm. Width of the flight and width of landing is 1.25m. Assume stairs to be supported on 230 mm thick masonry walls at the outer edges of the landing, parallel to the riser. Use grade of concrete as M20 and grade of steel as Fe 415. [7]

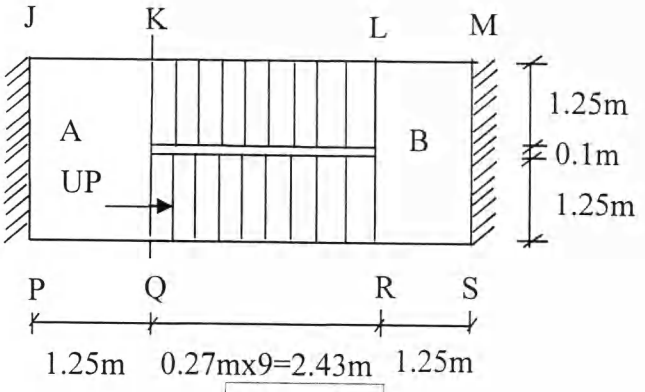

Figure 2

6. A pre tensioned concrete beam 250 mm wide and 350 mm deep is **prestressed** by 8 wires of 7 mm diameter at an initial stress of 1200 N/mm^2 with their centroid located at an eccentricity of 75 mm from soffit. Find the maximum stress in concrete immediately after transfer and total loss in prestress, allowing only for elastic shortening of concrete, creep and shrinkage of concrete if there is relaxation of 5% of steel stress. Use f_{cu}=42 N/mm^2, Es= 210 kN/mm^2,$E_c = 5700(f_{cu})^{1/2}$,Creep Coefficient=1.6. [6]

OR

In a Flanged beam, width of flange is 960 mm, width of web is 200 mm, depth of flange is 125mm, effective depth is 315 mm and factored moment is 240 kNm. Check the capacity of the **T-beam** to carry the load and if it safe, design the steel required. Assume Fe415 steel and grade 20 concrete. [6]