Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2018

Course: DESIGN OF CONCRETE STRUCTURES- CEEG 311 **Semester: V**
Programme: B TECH IN CIVIL ENGINEERING
Time: 03 hrs. **Max. Marks: 100**
Instructions: ATTEMPT **ALL QUESTION** IN **SECTION A**, **ANY FOUR** QUESTION IN **SECTION B** AND **ANY TWO** QUESTION **SECTION C**

SECTION A

S. No.		Marks	CO
Q1	Answer the following multiple choice questions 1) When there is limited space to accommodate the staircase, the ideal type selected is 1. Dog –legged 2. Open –well 3. Spiral 2) In the design of staircase in multistorey buildings, the riser should preferably be 1. 100 mm 2. 200 mm 3. 150 mm 3) Short columns have slenderness ratio less than 1. 30 2. 29 3. 12 4) The diameter of main reinforcement in columns should not be less than 1. 25 mm 2. 16 mm 3. 12 mm 5) The size of footing to support a reinforced concrete column depends upon the 1. Grade of concrete in column 2. Load transmitted to the footing by the column 3. Safe bearing pressure of the soil 6) The critical section to be considered for checking failure of footing against one way shear at a distance equal to the 1. Larger dimension of the column from its dace 2. Effective depth of the footing 3. Least lateral dimension of the column 7) Reinforced concrete slabs can be assumed as one-way slabs when the ratio of long to short span exceeds a. 1.0	**1x 20 = 20**	**CO1 CO2 CO4**

b. 1.5
c. 2.0

8) The minimum reinforcements expressed as a percentage of cross-section to be provided in all slabs when **HYSD** bars are used should be not less than
   1. 0.12 %
   2. 0.50 %
   3. 1.00 %

9) The span/ depth ratio recommended in the IS code for the design of **cantilever** beam
   1. 7
   2. 20
   3. 10

10) According to IS code, the maximum amount of tension and compression reinforcement in a reinforced concrete beam, expressed as a percentage of the cross sectional area is limited to a value of
   1. 2 %
   2. 0.15 %
   3. 4 %

11) Maximum permissible final deflection of reinforced concrete beam including all the effects of loads, creep and shrinkage should not exceed
   1. Span/350
   2. Span/250
   3. Span/480

12) The maximum permissible crack width in a reinforced concrete member subjected to severe condition
   1. 0.2 mm
   2. 0.1 mm
   3. 0.3 mm

13) For the bars in compression, the value of bond stress in tension is increased by
   1. 50 %
   2. 10 %
   3. 25 %

14) Lap splices should not be used for bars larger than
   1. 25 mm
   2. 16 mm
   3. 36 mm

15) The design shear strength of concrete depends upon
   1. Characteristic strength of reinforcement
   2. Torsional and bending moments acting on the beam
   3. Percentage reinforcement ratio and grade of concrete

16) The beam subjected to Torque moment, then side reinforcement must be provided if depth exceed
   1. 450 mm
   2. 300 mm
   3. 350 mm

	17) The maximum spacing of shear reinforcement used as vertical stirrups expressed as a percentage of the effective depth should not exceed the value 1. 0.95 2. 0.65 3. 0.75 18) The shear force resisted by the vertical stirrups is inversely proportional to the 1. Effective depth of the beam 2. Spacing of the stirrups 3. Area of reinforcement 19) The limiting value of the ratio of neutral axis to effective depth for beams reinforcement with Fe 415 steel bars is 1. 0.53 2. 0.46 3. 0.48 20) The ultimate strain in concrete for beams at the limit state of collapse is generally 1. 0.0025 2. 0.0035 3. 0.002		
SECTION B			
Q2	Design a dog legged staircase (waist slab type) for an office building to suit the following data: Height between floors = 3.2 m Risers = 160 mm, Tread = 270 mm Number of steps in flight = 12 Length of landing = 1.2 m Assume stairs to be supported on 230 mm thick masonry walls at the outer edges of the landing parallel to the risers. Adopt M 20 and Fe 415. Assume a live load 5 kN/ m^2 and finishing load = 0.6 kN/m^2. **Check for bond not required.** Hint:- Load is not distributed at landing.	**10**	**CO3** **CO4**
Q3	A cantilever beam having width 200 mm and effective depth 400 mm supports a uniformly distributed load and is reinforced with 4 bars of 16 mm diameter on the tension side. If the total factored load on the cantilever is 100 kN. Calculate:- a. The maximum local bond stress b. The anchorage length required c. The average bond stress, if the anchorage length provided is 1000 mm. Use M 20 and Fe 415.	**10**	**CO2**
Q4	A 5 m effective span simply supported beam is subjected to a load of 40 kN/m including its self-weight and a torque moment of 50 kNm. The size of beam is 250 mm X 500 mm. The beam is reinforced with 4 number – 20 mm bars at bottom (out of which 1 bar is curtailed at √2 times d from support) and 2 number – 10 mm bars at top. Design the beam against shear force and show the reinforcement detailing at the critical section for shear. Use M 20 and Fe 415.	**10**	**CO3** **CO4**

Q5	Design a reinforced concrete footing for a rectangular column of section 400 mm X 600 mm supporting an axial factored load of 1800 kN. The Safe bearing capacity of the soil at site is 200 kN/m^2. Adopt M 25 and Fe 500. Effective cover of 70 mm**. No detailing required.**	**10**	**CO3**
Q6	Design the reinforcement in a rectangular column of size 400 mm X 500 mm to support a design ultimate load of 800 kN together with a factored moment of 200 kNm. The column is of height 3 m and simply supported at both ends. Take M 20, Fe 500, d/D = 0.1 and reinforcement all around the column. Also, show the detailing of the cross section.	**10**	**CO3** **CO4**
SECTION-C			
Q7	Design a one way slab for an office floor which is continuous over T – beams spaced at 3.5 m clear span and width of web of beam and wall is 300 mm. Assume live load of 4kN/m^2, finishing load of 0.8 kN/m^2. Take M 20 and Fe 500. Effective cove of 20 mm and design for interior panel. Draw the detailing. **No check for bond required.**	**20**	**CO3** **CO4**
Q8	A T – beam slab floor of an office comprises a slab 150 mm thick spanning between the ribs spaced at 3 m centers. The effective span of beam is 8 m. Live load on floor is 4 kN/m^2 and finishing load of 0.6 kN/m^2. Use M 20 and Fe 415. **Design one intermediate T- beam.** No check for bond required. Take web width 300 mm, effective cover 50 mm and effective depth 500 mm. Draw the detailing.	**20**	**CO3** **CO4**
Q9	Design the reinforcements in a circular column of diameter 300 mm to support a service load of 800 kN. The column has an unsupported length of 3m and is braced against sway at top and bottom. The column is reinforced with helical ties. Adopt M 20 and Fe 415. Draw the detailing. Write the failure criteria for columns.	**17+3 = 20**	**CO3** **CO4** **CO2**

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SECTION A

S. No.		Marks	CO
Q1	Answer the following multiple choice questions 1) When there is limited space to accommodate the staircase, the ideal type selected is 1. Dog –legged 2. Open –well 3. Spiral 2) In the design of staircase in multistorey buildings, the tread should preferably be 1. 100 mm 2. 300 mm 3. 150 mm 3) Long columns have slenderness ratio greater than 1. 30 2. 29 3. 12 4) The diameter of main reinforcement in columns should not be less than 1. 25 mm 2. 16 mm 3. 12 mm 5) The size of footing to support a reinforced concrete column depends upon the 1. Grade of concrete in column 2. Load transmitted to the footing by the column 3. Safe bearing pressure of the soil 6) The critical section to be considered for checking failure of footing against two way shear at a distance equal to the 1. Larger dimension of the column from its dace 2. Half of effective depth of the footing 3. Least lateral dimension of the column 7) Reinforced concrete slabs can be assumed as two-way slabs when the ratio of	**1x 20 = 20**	**CO1 CO2 CO4**

long to short span lesser than
1. 1.0
2. 1.5
3. 2.0

8) The minimum reinforcements expressed as a percentage of cross-section to be provided in all slabs when **Mild steel** bars are used should be not less than
1. 0.15 %
2. 0.50 %
3. 1.00 %

9) The span/ depth ratio recommended in the IS code for the design of **simply supported** beam
1. 7
2. 20
3. 10

10) According to IS code, the maximum amount of reinforcement in a reinforced concrete column, expressed as a percentage of the cross sectional area is limited to a value of
1. 0.8 %
2. 6 %
3. 4 %

11) Maximum permissible final deflection of reinforced concrete beam including all the effects of loads, creep and shrinkage should not exceed
1. Span/350
2. Span/250
3. Span/480

12) The maximum permissible crack width in a reinforced concrete member subjected to severe condition
1. 0.2 mm
2. 0.1 mm
3. 0.3 mm

13) For the bars in compression, the value of bond stress in tension is increased by
1. 50 %
2. 10 %
3. 25 %

14) Lap splices should not be used for bars larger than
1. 25 mm
2. 16 mm
3. 36 mm

15) The design shear strength of concrete depends upon
1. Characteristic strength of reinforcement
2. Torsional and bending moments acting on the beam
3. Percentage reinforcement ratio and grade of concrete

16) The beam subjected to Torque moment, then side reinforcement must be provided if depth exceed
1. 450 mm

	2. 300 mm 3. 350 mm 17) The maximum spacing of shear reinforcement used as vertical stirrups expressed as a percentage of the effective depth should not exceed the value 1. 0.95 2. 0.65 3. 0.75 18) The shear force resisted by the vertical stirrups is inversely proportional to the 1. Effective depth of the beam 2. Spacing of the stirrups 3. Area of reinforcement 19) The limiting value of the ratio of neutral axis to effective depth for beams reinforcement with Fe 500 steel bars is 1. 0.53 2. 0.46 3. 0.48 20) The ultimate strain in concrete for columns at the limit state of collapse for axially loaded column is generally 1. 0.0025 2. 0.0035 3. 0.002		
	SECTION B		
Q2	Design a dog legged staircase (waist slab type) for an office building to suit the following data: Height between floors = 3.2 m Risers = 160 mm, Tread = 270 mm Number of steps in flight = 12 Length of landing = 1.2 m Assume stairs to be supported on 230 mm thick masonry walls at the outer edges of the landing parallel to the risers. Adopt M 20 and Fe 415. Assume a live load 5 kN/ m^2 and finishing load = 0.75 kN/m^2. **Check for bond not required.** Hint:- Load is not distributed at landing.	**10**	**CO3** **CO4**
Q3	A cantilever beam having width 200 mm and effective depth 400 mm supports a uniformly distributed load and is reinforced with 4 bars of 16 mm diameter on the tension side. If the total factored load on the cantilever is 110 kN. Calculate:- a. The maximum local bond stress b. The anchorage length required c. The average bond stress, if the anchorage length provided is 1000 mm. Use M 20 and Fe 415.	**10**	**CO2**
Q4	A 5 m effective span simply supported beam is subjected to a load of 42 kN/m including its self-weight and a torque moment of 50 kNm. The size of beam is 250 mm X 500 mm. The beam is reinforced with 4 number – 20 mm bars at bottom (out of which 1 bar is curtailed at √2 times d from support) and 2 number – 10 mm bars at	**10**	**CO3** **CO4**

	top. Design the beam against shear force and show the reinforcement detailing at the critical section for shear. Use M 20 and Fe 415.		
Q5	Design a reinforced concrete footing for a rectangular column of section 400 mm X 600 mm supporting an axial factored load of 1900 kN. The Safe bearing capacity of the soil at site is 200 kN/m^2. Adopt M 25 and Fe 500. Effective cover of 70 mm**. No detailing required.**	**10**	**CO3**
Q6	Design the reinforcement in a rectangular column of size 400 mm X 500 mm to support a design ultimate load of 900 kN together with a factored moment of 200 kNm. The column is of height 3 m and simply supported at both ends. Take M 20, Fe 500, d/D = 0.1 and reinforcement all around the column. Also, show the detailing of the cross section.	**10**	**CO3 CO4**
SECTION-C			
Q7	Design a one way slab for an office floor which is continuous over T – beams spaced at 3.5 m clear span and width of web of beam and wall is 300 mm. Assume live load of 4 kN/m^2, finishing load of 0.8 kN/m^2. Take M 25 and Fe 500. Effective cove of 20 mm and design for interior panel. Draw the detailing. **No check for bond required.**	**20**	**CO3 CO4**
Q8	A T – beam slab floor of an office comprises a slab 150 mm thick spanning between the ribs spaced at 3 m centers. The effective span of beam is 8 m. Live load on floor is 4 kN/m^2 and finishing load of 0.8 kN/m^2. Use M 20 and Fe 415. **Design one intermediate T- beam.** No check for bond required. Take web width 300 mm, effective cover 50 mm and effective depth 500 mm. Draw the detailing.	**20**	**CO3 CO4**
Q9	Design the reinforcements in a circular column of diameter 300 mm to support a service load of 900 kN. The column has an unsupported length of 3m and is braced against sway at top and bottom. The column is reinforced with helical ties. Adopt M 20 and Fe 415. Draw the detailing. Write the failure criteria for columns.	**17+3 = 20**	**CO3 CO4 CO2**