Total No. of Questions: 20

Enrollment No : _____

MEDICAPS UNIVERSITY

Faculty of Engineering

End Semester Examination May 2025

CE3CO28 RCC Design

Programme	:	B.Tech.	**Branch/Specialisation**	:	CE
Duration	:	3 hours	**Maximum Marks**	:	60

Note: *All questions are compulsory. Internal choices, if any, are indicated. Assume suitable data if necessary. Notations and symbols have their usual meaning.*

Section 1 (Answer all question(s))

		Marks	CO	BL
Q1.	Which of the following is the primary factor affecting the strength of hardened concrete? (•) Water-cement ratio ( ) Aggregate size ( ) Curing temperature ( ) Mixing time	1	1	1
Q2.	Compressive strength of concrete is usually tested at: ( ) 3 days ( ) 7 days (•) 28 days ( ) 56 days	1	1	1
Q3.	The depth of the neutral axis in a singly reinforced concrete beam depends on: ( ) Grade of concrete ( ) Grade of steel ( ) Area of reinforcement (•) All of the above	1	1	1
Q4.	Which type of beam has reinforcement both in the tension and compression zones? ( ) Simply supported beam ( ) Cantilever beam ( ) Singly reinforced beam (•) Doubly reinforced beam	1	1	1
Q5.	In a one-way slab, the main reinforcement is provided along: ( ) Both directions (•) Shorter span only ( ) Longer span only ( ) Diagonal direction	1	1	1
Q6.	A slab is considered a two-way slab if: ( ) It is supported on only two opposite sides (•) It is supported on all four sides and $L/B < 2$ ( ) It is supported on all four sides and $L/B \geq 2$ ( ) It has only secondary reinforcement	1	1	1
Q7.	Short columns primarily fail due to- ( ) Buckling (•) Crushing ( ) Shear ( ) Fatigue	1	1	1
Q8.	The minimum eccentricity for a column as per IS 456:2000 is- ( ) L/300 + D/30 ( ) L/250 + D/30 (•) L/500 + D/20 ( ) L/400 + D/40	1	1	1
Q9.	The primary function of a footing is to: ( ) Support the walls only (•) Transfer the load from the structure to the soil safely ( ) Increase the height of the structure ( ) Enhance the aesthetic appearance of the building	1	1	1

Q10. The type of footing that is used when the soil has a low bearing capacity and requires a larger area to distribute the load is: **1 1 1**

- ○ Isolated footing
- ○ Combined footing
- ◉ Raft footing
- ○ Strap footing

Section 2 (Answer all question(s))

Marks CO BL

Q11. Define concrete and function of its ingredients. **2 1 1**

Rubric	Marks
Definition of concrete & Function of ingredients	2

Q12. (a) Determine the limiting moment carrying capacity of a reinforced concrete rectangular section of size 250 x 550 mm deep (effective) reinforced on the tension side with four 20 mm diameter of bars. The concrete used is of grade M20 and reinforced steel is mild steel of grade Fe250. **8 2 2**

Rubric	Marks
X_u = (0.87 fy A_{st} / 0.362 f_{ck} b)= 151.05 mm,Xu,max = 0.531d = 292.05 mm,Mu,lim= Tu x z = 0.87fy Ast (d-0.416 xu)=133.19 kNm	8

(OR)

(b) Determine the depth of the neutral axis of a beam 250 mm x 400 mm, reinforced with 3 bars of 20 mm diameter. Also check for the type of section. Use M20 concrete and Fe 415 steel.

Rubric	Marks
X_u = (0.87 fy A_{st} / 0.362 f_{ck} b)= 189 mm,Xu,max = 192 mm,Xu < Xu,max The beam is under reinforced	8

Section 3 (Answer all question(s))

Marks CO BL

Q13. Define singly reinforced beam and doubly reinforced beam. **2 1 1**

Rubric	Marks
Define Singly reinforced beam	1
Define doubly reinforced beam	1

Q14. (a) An RCC beam is required to resist a bending moment of 70 kN-m. Design the beam for flexure, taking b/d =0.5. Use M20 concrete and Fe 415 TMT. **8 3 3**

Rubric	Marks
Factored Moment M_u = 105 x 10^6 Nmm,Effective Depth d= 425 mm b = 215 mm,Area of steel = 857.1 mm2 Numbers of bars 2.72 (3),Beam dimension = 215 mm x 470 mm	8

(OR)

(b) Analyze T-beam floor system has 120 mm thick slab supported on a beams. The width of beam is 300 mm and effect depth is 580 mm. The beam is reinforced with 8 bars of 20 mm diameter. Use M20 grade of concrete and Fe415 steel. The beam are spaced 3m center of center. The effective span of beam is 3.6 m.

Rubric	Marks
Effective width of flange(bf) = 1620 mm,Depth of neutral axis (xu) = Xu = (0.87 fy Ast / 0.362 fck b)= 77.8 mm,Xu,max = 0.48d = 278.4 mm,Moment of resistance (Mu) = 496.61 kNm	8

Section 4 (Answer all question(s))

Marks CO BL

Q15. Write difference between on way slab and two way slab. **2 1 1**

Rubric	Marks
3 - Difference	2

Q16. (a) Design a simply supported roof slab for the room 7.5 m x 3.5 m clear in size. The slab is carrying an imposed load of 5 kN/m^2. Assume effective depth of beam 125mm, Use M20 mix and Fe415 steel. **8 4 4**

Rubric	Marks
Factored Moment (M_u)= 21.6 x 10^6 Nmm,Effective depth required dreq= 88mm,Area of steel (Ast) = 523.4 mm2 Distribution steel = 225 mm2,Check for shear = Vu = 22970 N Nominal Shear Stress = 0.81 N/ mm2 Design shear strength of concrete = 0.328 N/ mm2	8

(OR)

(b) Design a reinforced concrete slab for the room of the clear dimension 4 m x 5m. The slab is supported on walls of width 300 mm. The slab is carrying a live load of 4 kN/m^2 and floor finish 1 kN/m^2. Assume effective depth 161 mm, Use M20 concrete and Fe415 steel. The corner of slab held down.

Rubric	Marks
Design moment = 18.5 x 10^6 Nmm,Maximum Shear = 29.65 kN,Main Reinforcement (Ast) = 332.5 mm2 Distribution steel = 261 mm2,Check for shear = tu = 0.20 N/ mm2 Check for deflection = (l/d) = 32 (l/d)prov= 26 Torsional Reinforcement (Ast) = 251 mm2	8

Section 5 (Answer all question(s))

Marks CO BL

Q17. Differentiate between long column and short column. **2 2 2**

Rubric	Marks
each difference give one mark	2

Q18. (a) Find the ultimate load carrying capacity and allowable load for a short column of size 500 mm x 500 mm. The column is reinforced with 4-25mm diameter bars. Use M20 concrete and HYSD grade Fe415 steel. Assume e_{min} < 0.05 D. **8 3 3**

Rubric	Marks
Calculating = (Pu / fck bD) ,Calculating = (Mu / fck bD2) ,Calculating = Asc,Design of lateral Ties	8

(OR)

(b) Design an reinforced concrete square column of 500 mm side to carry an ultimate load of 2000 kN at an eccentricity of 180 mm. Use M20 concrete and Fe415 Steel.

Rubric	Marks
Calculating = (P_u / fck bD) ,Calculating = (Mu / fck bD2) ,Calculating = Asc,Design of lateral Ties	8

Section 6 (Answer all question(s))

Marks CO BL

Q19. What are the main requirements of the footing of a structure? **2 1 1**

Rubric	Marks
Each requirements of the footing of a structure give one mark	2

Q20. (a) Design square footing of uniform thickness for an excellent loaded column of 450 mm x 450 mm size. The safe bearing capacity of a soil is 190 kN. Load on column in 850 kN. Use in M20 concrete and Fe-415 Steel. **8 4 4**

Rubric	Marks
Load calculation. Wc + wf =935 kN Area of footing A=4.92 m2,Depth of footing by one way shear = 0.396m,Depth of footing by two way shear d= 0.367m,Depth of footing by bending moment = d=0.192m	8

(OR)

(b) Design a rectangular footing of uniform thickness for an axially loaded column of size 300mm x 600 mm load on column is 1150 kN. Safe bearing capacity of the soil is 200 kN/m^2. Use M-20 concrete and Fe-415 steel.

Rubric	Marks
Area of footing= 6.325 m2,Depth by one way shear = 0.681m,Depth by two way shear = 0.607 m,Depth by bending moment = 0.330m,Area of reinforcement = 2225 mm2	8

******