Graphic Era
HILL UNIVERSITY

End Term (Odd) Semester Examination November 2025

Roll no..............................

Name of the Course and semester: B.Tech (Civil Engg.) – Vth Semester
Name of the Paper: *Reinforced Cement Concrete*
Paper Code: TCE 502

Time: 3 hour   Maximum Marks: 100
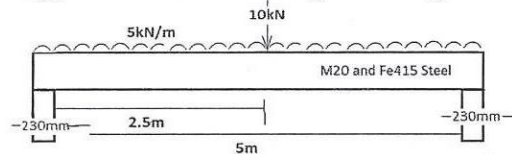
Note:
- *(i)* All the questions are compulsory.
- *(ii)* Answer any two sub questions from a, b and c in each main question.
- *(iii)* Total marks for each question is 20 (twenty).
- *(iv)* Each sub-question carries 10 marks.

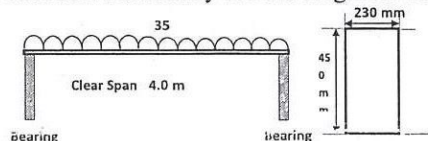**Q1**   (2X10=20 marks)

(a) Explain about any 5 different properties of concrete and its dependencies on the quality of its constituent materials/concrete production? (CO 1)

(b) Explain the concept and feasibility of under reinforced, over reinforced, and balanced sections in the concrete flexure design philosophy? (CO 1)

(c) Explain the working principles and the purpose of any 5 Destructive and NDT Tests conducted for determining the concrete ~~~~? Parameters? (CO 1)

Q2   (2X10=20 marks)

(a) Differentiate the three design philosophies used in RCC design, stating their pros and cons of each in brief? (CO 2)

(b) Design an under reinforced singly reinforced beam for the given loading case in Limit State Method?
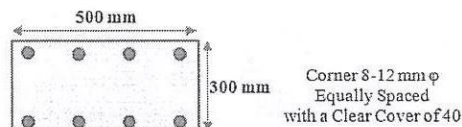

(CO 2)

(c) Design a balanced doubly reinforced rectangular section applying Limit State method with a dimension restriction of 230 mm x 450mm, using M20 Grade Concrete and Fe415 Grade Steel material. Top and bottom clear covers are 25mm. Check for Sufficiency of bond length for the main reinforcement bar?

(CO 2)

Q3   (2X10=20 marks)

(a) Write the design philosophy of a compression member subjected to uniaxial eccentric loading? Explain the use of interaction curves in column design? (CO 3)

(b) Design reinforcement for a Square Column of size 500 X 500 mm, subject to an axial load of 2000kN under service dead and live loads. The column has an unsupported length of 3.0 m and is braced against sideways in both directions not restrained at the top end against rotation. Use M25 and Fe 415 Grades of Steel? (CO 3)

(c) Determine the Ultimate Load Carrying capacity of the given Short Rectangular Column with the given cross section provided with horizontal lateral ties of 6mm dia bar at a pitch of 160 mm . M25 and Fe 415 Grade Steels are being Used.
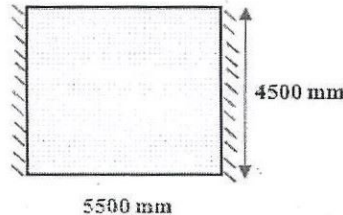

(CO 3)

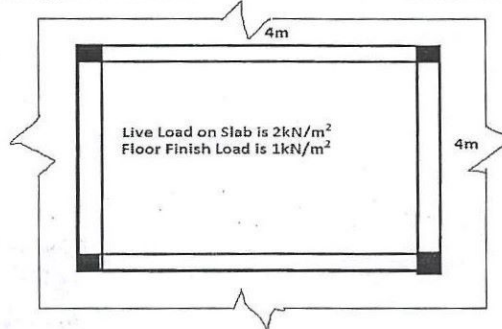## End Term (Odd) Semester Examination November 2025

Q4 (2X10=20 marks)

(a) Explain the typical reinforcement detailing and corresponding functional resistance offered by them, for simply supported beam, cantilever beam, one way slab and two way slabs with rough sketches? (CO 4)

(b) Design and show the rough detailing of reinforcement for the given slab panel with a thickness restriction of 125mm? The slab panel is supposed to carry an overall working load of 6 kN/m² intensity over the entire area. M25 and Fe 415 grade steel is being used.

4500 mm

5500 mm

(CO 4)

(c) Design an interior panel of a building slab with the given dimensions? Supporting Bems are of 230mm in plan. Assume missing data suitably, M20 and Fe 415 Grade Steel are used with a cover of 15mm.
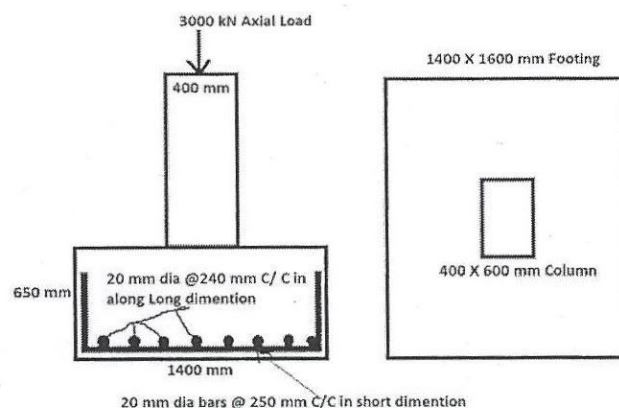

4m

Live Load on Slab is 2kN/m²
Floor Finish Load is 1kN/m²

4m

(CO 4)

Q5 (2X10=20 marks)

(a) Write the general sequential steps of designing a simple square footing with uniaxial eccentricity of the column position? You can even explain the same using the SP-16 design aid also? (CO 5)

(b) Design an isolated square footing for flexure with equal offsets in both directions to support a Square column of size 250 X 250 mm carrying a Total Axial Load of 3000 kN, Bearing capacity of the Soil is determined to be 150 kN/m². Use M20 grade Concrete and Fe 415 Grade Steel. Assume necessary data suitably. (CO 5)

(c) Check the given isolated footing for safety against two way shear? Assume that M25 Grade concrete and Fe 415 Grade steel are used.

3000 kN Axial Load

400 mm

1400 X 1600 mm Footing

650 mm

20 mm dia @240 mm C/ C in along Long dimension

400 X 600 mm Column

1400 mm

20 mm dia bars @ 250 mm C/C in short dimention

(CO 5)

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Table: For general LSM Design Use

Stress-Strain Values for		Fy=500				Stress-Strain Values for		Fy=415		
K	Strain	Ultimate Stress - Strain Curve	Idealized Curve	Corresponding Strain		K	Strain	Ultimate Stress-Strain Curve	Idealized Curve	Corresponding Strain
0.0000	0.0000	0.0000	0.00	0.000000		0.0000	0.0000	0.0000	0.00	0.000000
0.8000	0.0001	400.0000	347.83	0.001839		0.8000	0.0001	332.0000	288.70	0.001543
0.8500	0.0003	425.0000	369.57	0.002148		0.8500	0.0003	352.7500	306.74	0.001834
0.9000	0.0007	450.0000	391.30	0.002657		0.9000	0.0007	373.5000	324.78	0.002324
0.9500	0.0010	475.0000	413.04	0.003065		0.9500	0.0010	394.2500	342.83	0.002714
0.9750	0.0020	487.5000	423.91	0.004120		0.9750	0.0020	404.6250	351.85	0.003759
1.0000	0.0035	500.0000	434.78	0.005674		1.0000	0.0035	415.0000	360.87	0.005304

Chart. 34 COMPRESSION WITH BENDING — Rectangular Section — Reinforcement Distributed Equally on Two Sides