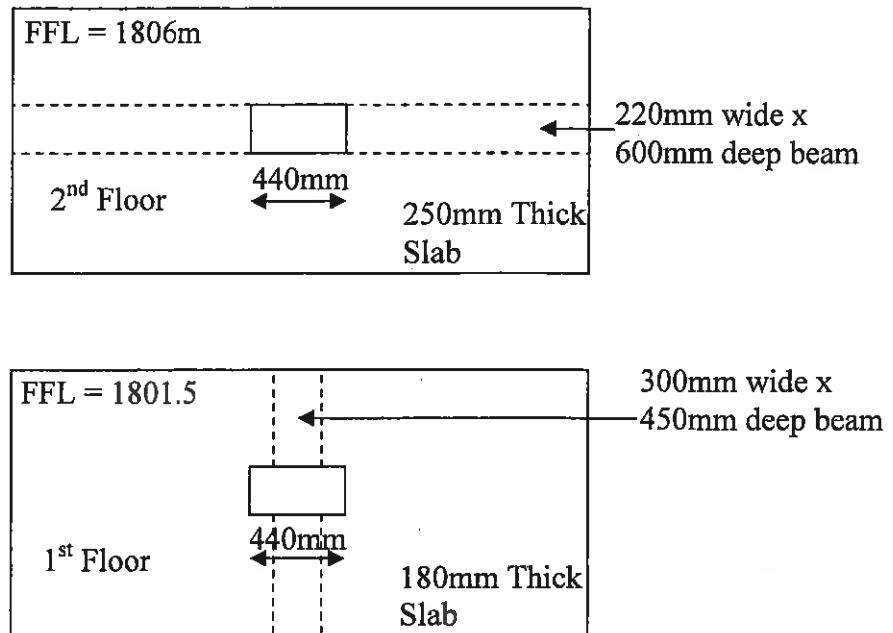|		
PROGRAM	:	B.TECH *ENGINEERING: CIVIL*
SUBJECT	:	**REINFORCED CONCRETE DESIGN IV**
CODE	:	**TGM411**
DATE	:	WINTER SUPPLEMENTARY EXAMINATION 15 JULY 2014
DURATION	:	8H00 – 12H00
WEIGHT	:	40 : 60
TOTAL MARKS	:	103
EXAMINER	:	MR C BRUWER
MODERATOR	:	MR B. RAATH
NUMBER OF PAGES	:	4 PAGES
INSTRUCTIONS	:	THIS IS A PARTIAL OPEN BOOK EXAMINATION, THE FOLLOWING IS ALLOWED: • SANS 10100 • 2 PAGES WITH STUDENT'S OWN NOTES
REQUIREMENTS	:	PROGRAMABLE POCKET CALCULATORS ALLOWED.

QUESTION 1

Design the column in the sketch below by:
- Determining the ultimate loads
- Calculate the longitudinal reinforcement and stirrups   (49)

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┌─────────────────────────────────────────┐
│ FFL = 1806m                              │          ┌── 220mm wide x
│                                          │          │   600mm deep beam
│ ─ ─ ─ ─ ─ ─ ─ ┌────────┐─ ─ ─ ─ ─ ─ ←────┤
│ ─ ─ ─ ─ ─ ─ ─ └────────┘─ ─ ─ ─ ─ ─ ─ ─ ─│
│                                          │
│  2nd Floor      440mm                   │
│               ◄────►    250mm Thick      │
│                         Slab             │
└─────────────────────────────────────────┘
```

```
┌─────────────────────────────────────────┐
│ FFL = 1801.5       ¦  ¦                   │      300mm wide x
│                    ¦←─¦────              ─┤──────450mm deep beam
│                    ¦  ¦                   │
│                 ┌──────┐                  │
│                 └──────┘                  │
│  1^st Floor       440mm                   │
│               ◄────►    180mm Thick       │
│                         Slab              │
└─────────────────────────────────────────┘
```

Axial load:
- Ultimate Live = 300kN
- Nominal Dead = 150kN

Moments about the x-axis
- Ultimate Top = 45kNm
- Ultimate Bottom = -37kNm

Moments about the y-axis
- Ultimate Top = -12kNm
- Ultimate Bottom = -8kNm

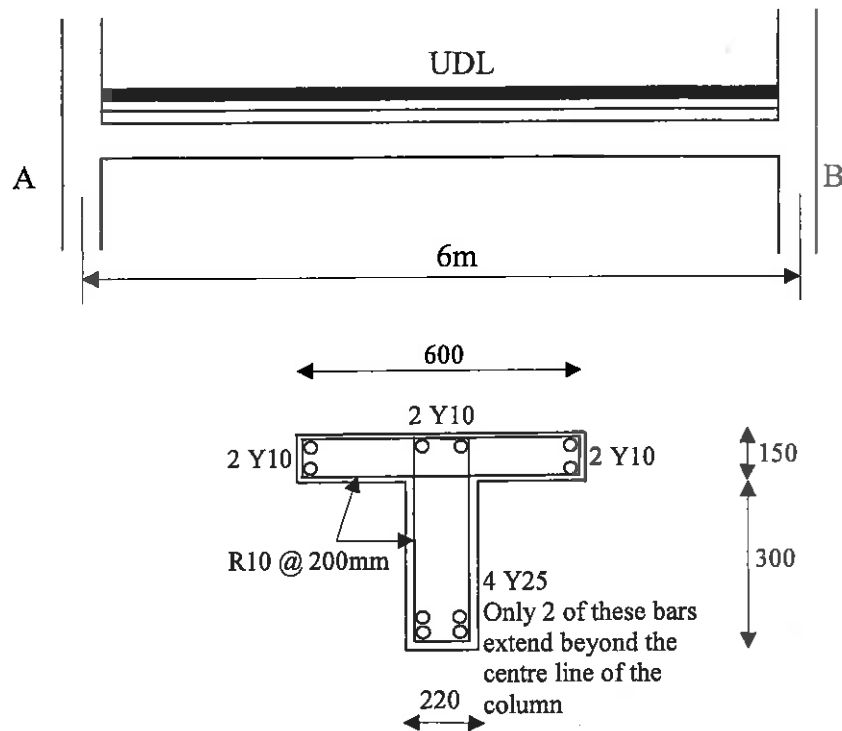Concrete = 30/19 with moderate exposure conditions
The structure is braced in both directions.

Determine how many vertical Y25 vertical bars are required per face and the spacing of R10 stirrups

QUESTION 2

Determine the ultimate applied UDL the existing beam indicated below can carry. Take flexure and shear into consideration.   (31)

UDL

A   B

6m

600

2 Y10

2 Y10   2 Y10

150

R10 @ 200mm

300

4 Y25
Only 2 of these bars
extend beyond the
centre line of the
column

220

Take the own weight of the beam into consideration.
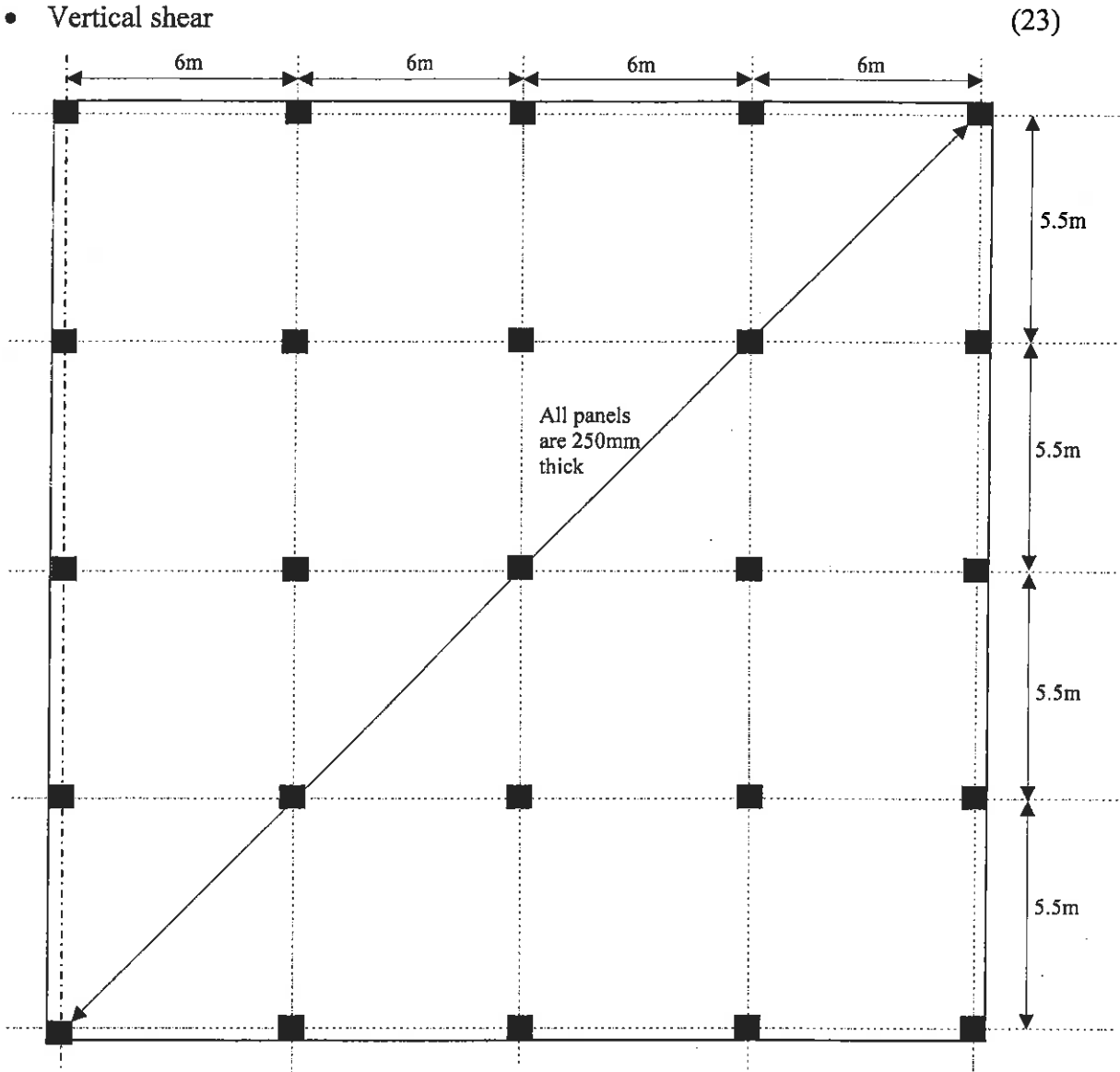Consider the beam to be simply supported at columns A and B.
The cover to the stirrups is all 25mm.
Cores were drilled and tested. The concrete compressive strength according to the core is 28 MPa.

QUESTION 3

Determine the moments (not reinforcement) for the flat slab (without drops or column heads) as indicated below in the long span direction only.

- Determining the ultimate load
- Check if the conditions of the of the simplified load arrangement apply
- Negative moment
- Vertical shear   (23)

Design Data:
All columns are 300mm x 300mm
Concrete =30/19 with mild exposure conditions
All dimensions are from center line to center line
The flat slab would support a live load of 4kN/m^2
Take own weight of the slab into account

TOTAL: 103