TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY

Department of BUILDING AND Civil engineering

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN CIVIL ENGINEERING

DCE 2303: DESIGN OF CONCRETE STRUCTURES

END OF SEMESTER EXAMINATION

SERIES: APRIL 2025

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **five** questions. Attempt any THREE questions.

Do not write on the question paper.

QUESTION ONE (20 Marks)

(a) A simply supported rectangular beam of 7 m span carries characteristic dead (including self-weight of beam), g_k, and imposed, q_k, loads of 12 kNm^{-1} and 8 kNm^{-1} respectively (Fig. 1). The beam dimensions are breadth, b, 275 mm and effective depth, d, 450 mm. Assuming the following material strengths, calculate the area of reinforcement required. (10 Marks)

f_{cu} = 30 Nmm^{-2} f_y = 500 N/mm^2

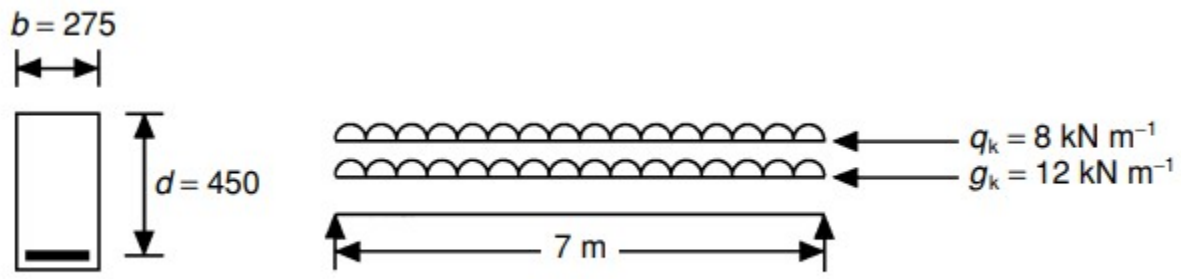

Fig 1

(b) An internal column in a braced two-storey building supporting an approximately symmetrical arrangement of beams (350 mm wide × 600 mm deep) results in characteristic dead and imposed loads each of 1100 kN being applied to the column. The column is 350 mm square and has a clear height of 4.5 m as shown in Fig. 2. Design the longitudinal reinforcement and links assuming f_{cu} = 40 Nmm−2 and f_y & f_{yv} = 500 Nmm^{-2} (10 Marks)

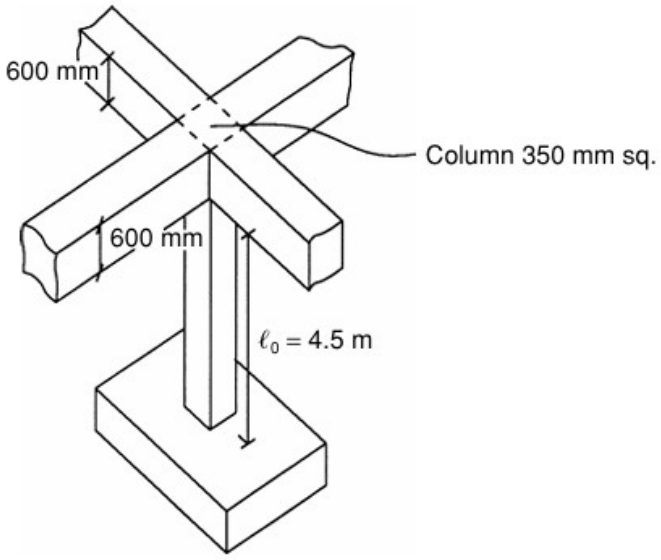

Fig 2

QUESTION TWO (20 Marks)

Design the shear reinforcement for the beam shown in Fig. 3 using high yield steel (f_y = 500 Nmm^{-2}) links for the following load cases:

i) $q_k = 0$ (ii) $q_k = 10\ kNm^{-1}$ (20 Marks)

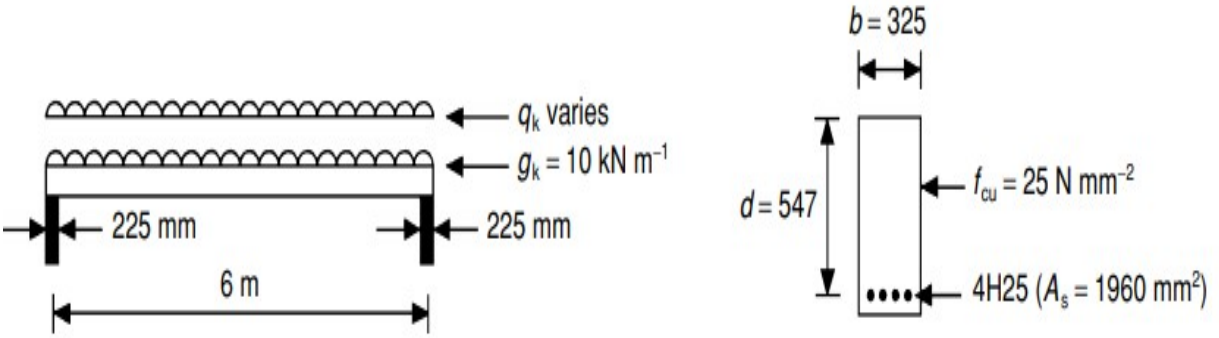

Fig 3

QUESTION THREE (20 Marks)

(a) State the two principal categories of limit states normally considered in design and describe what each state entails. (7 Marks)

(b) A reinforced concrete floor subject to an imposed load of 4 kNm^{-2} spans between brick walls as shown in fig 4. Design the floor for exposure class XC1 assuming the following material strengths: $f_{cu} = 35\ Nmm{-}2\ f_y = 500\ Nmm^{-2}$. (13 Marks)

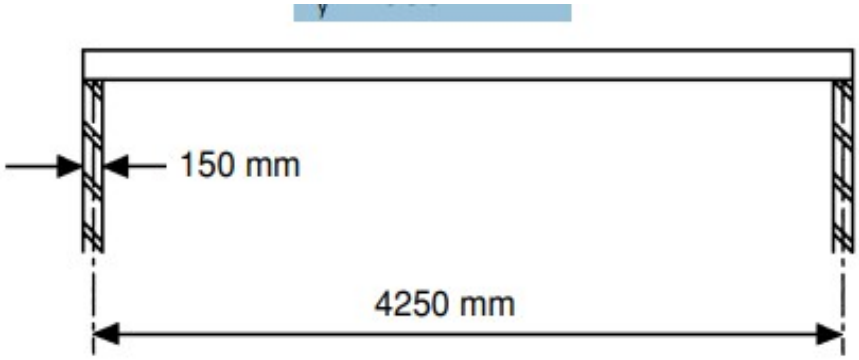

Fig 4

QUESTION FOUR (20 Marks)

A reinforced concrete beam which is 300 mm wide and 600 mm deep is required to span 6.0 m between the centres of supporting piers 300 mm wide (Fig. 5). The beam carries dead and imposed loads of 25 kNm^{-1} and 19 kNm^{-1} respectively. Assuming fcu

= 30 Nmm−2 , $f_y = f_{yv} = 500$ Nmm^{-2} and the exposure class is XC1 (25mm), design the beam. (20 Marks)

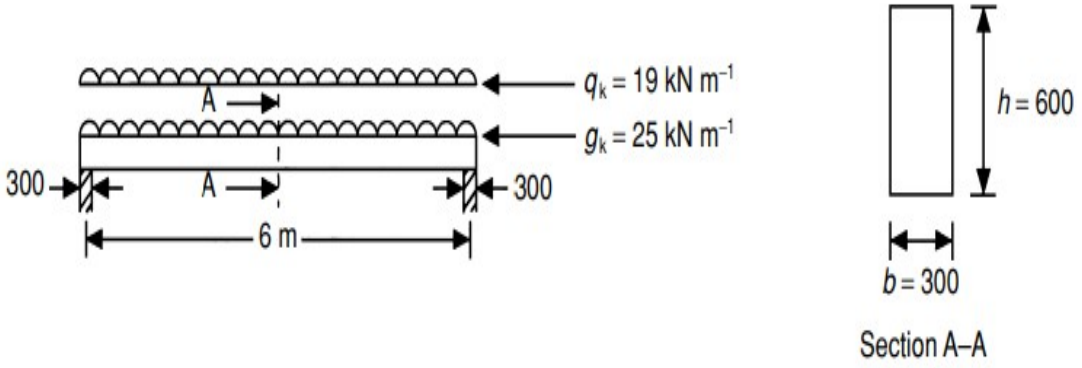

Fig 5

QUESTION FIVE (20 Marks)

Q 5. The reinforced concrete beam shown in Fig. 6has an effective span of 9 m and carries uniformly distributed dead (including self weight of beam) and imposed loads of 4 and 5 kNm−1 respectively. Design the bending reinforcement assuming the following: fcu = 30 Nmm−2 fy = 500 Nmm−2 Cover to main steel = 40 m

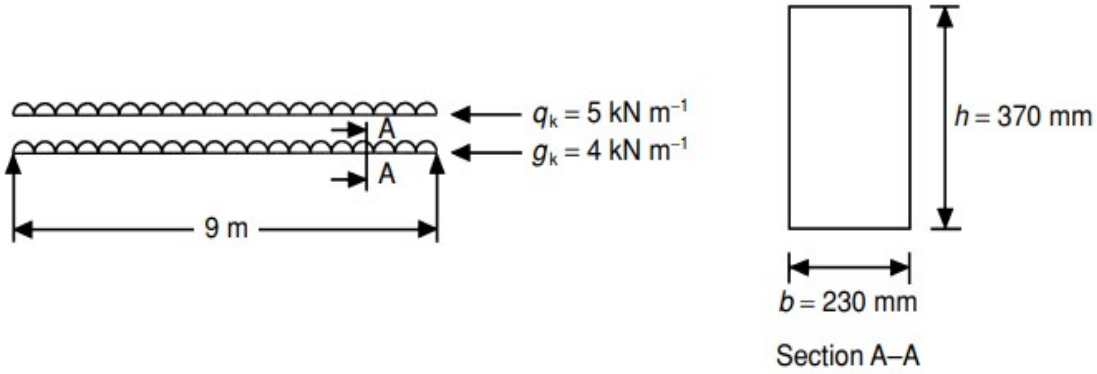

FIG 6

(20 Marks)