# UNIVERSITY COLLEGE LONDON

University of London

## EXAMINATION FOR INTERNAL STUDENTS

For The Following Qualification:-

*B.Sc.*

**ES217A: Structural Form and Function A**

COURSE CODE      :  **ENVS217A**

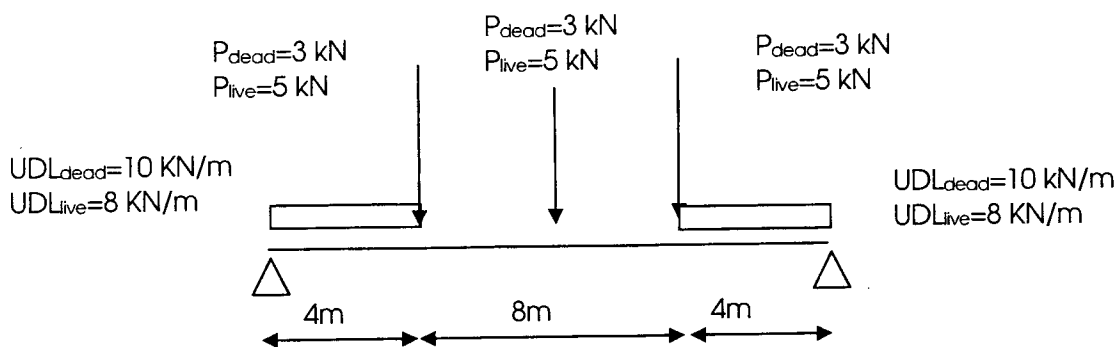UNIT VALUE       :  **0.50**

DATE             :  **07-MAY-04**

TIME             :  **10.00**

TIME ALLOWED     :  **3 Hours**

**TURN OVER**

## ENVS217A STRUCTURAL FORM AND FUNCTION

Answer EIGHT questions. All questions carry equal marks (12.5)

1. Please explain the connection between wind loading, shear walls, braced and unbraced frames, concrete cores and forms of bracing. Explain what they are (shear walls, braced and unbraced frames, concrete cores and forms of bracing), what is their purpose and in what circumstances they are used.

2. Using diagrams provided sketch shear force and bending moment diagrams and calculate and locate maximum values using given formulas, for the beam shown below. List appropriate equations for deflection (but do not calculate). Carry out the calculations for **design** (not characteristic) loading.

$P_{dead}$=3 kN
$P_{live}$=5 kN

$P_{dead}$=3 kN
$P_{live}$=5 kN

$P_{dead}$=3 kN
$P_{live}$=5 kN

$UDL_{dead}$=10 KN/m
$UDL_{live}$=8 KN/m

$UDL_{dead}$=10 kN/m
$UDL_{live}$=8 KN/m

4m    8m    4m

3. a. Show using example of a 152x152x30UC beam that positioning it vertically or horizontally will change its capacity to withstand bending. Use given tables. (6.5 marks)

   b. Explain the difference between direct and bending stresses on a structural element. (6 marks)

4. Explain the differences between:
   a. The load-bearing and framed structures
   b. Yield point and ultimate strength
   c. Behaviour of cohesive and non-cohesive soils

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5. Calculate the value of F34 and F45 in the truss below and establish if they are tensile or compressive.
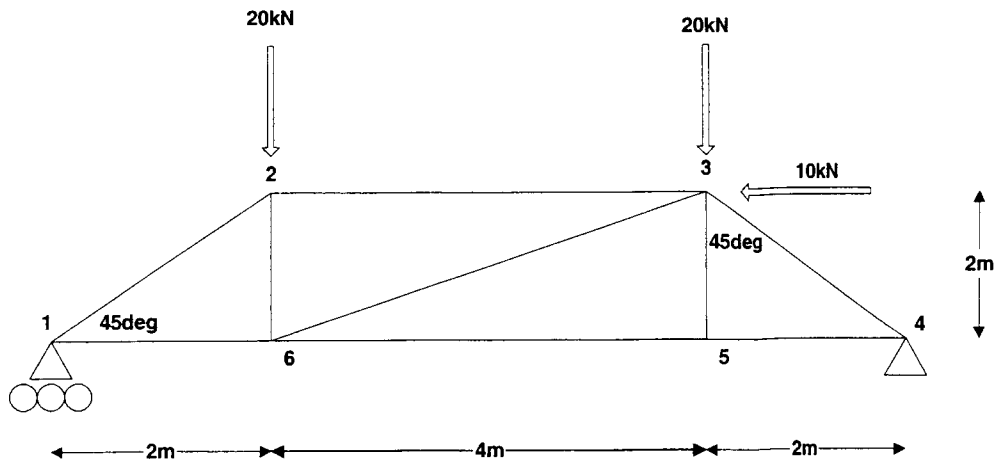


6. Describe the characteristics of the two main types of piling (replacement and displacement) and typical materials and methods of construction for each group.

7. Retaining walls – sketch all three modes of failure and describe why and how they occur and what can be done to prevent them.

8. Steel beams – describe steps taken in a process of designing a steel beam when the top flange is unrestrained (conservative method).

9. RC beams – what is the procedure of designing reinforcement (both against shear and bending)?

10. In designing of timber beams describe the significance of modification factors:
- Strength characteristics K2
- Duration of loading K3
- Depth factor K7
- Load-sharing systems K8
- Load-sharing systems K9 for Young's modulus
  and their use.

11. Describe the difference in principles of design of masonry under vertical and horizontal loading.

12. A steel beam UB section and 2m long is subjected to a tensile force of 1200Kn. As a result beam has stretched. Maximum allowable extension in length cannot be more than 5mm. Young's modulus for steel is E=2.05E5 N/mm². Select a relevant beam type from the tables, which will fulfil this condition.

END OF PAPER

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