

# UNIVERSITY COLLEGE LONDON

*University of London*

## EXAMINATION FOR INTERNAL STUDENTS

*For the following qualifications :-*

*B.Sc.*

### **ES1110: Structural Form and Function**

COURSE CODE : **ENVS1110**

UNIT VALUE : **0.50**

DATE : **20-MAY-02**

TIME : **10.00**

TIME ALLOWED : **3 hours**

02-C0420-3-30

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**TURN OVER**

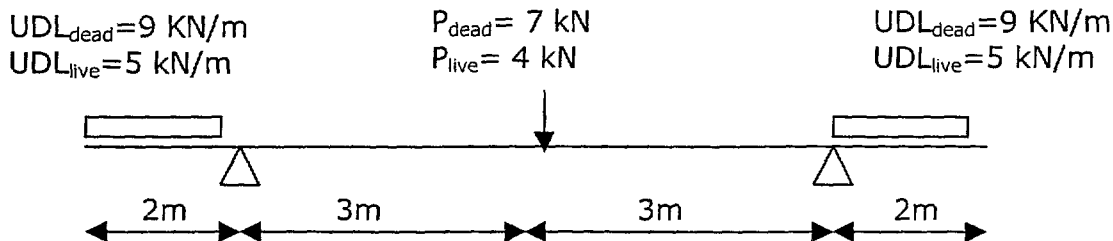
## ENVS 1110 Structural Form and Function

Answer 8 questions. All questions carry equal marks.

1. Describe why engineers have to take into account all three factors – strength, stability and stiffness while designing structures. What aspects of structural behaviour are these factors responsible for and what sort of calculations are needed to ensure all three? (No formulas, just descriptions, please) – (12.5 marks)

2. A contractor has only 100 mm depth available for replacing the existing, damaged timber beam. The calculations specify a 250mm deep x 50 mm wide joist, as sufficient to withstand bending. But it is realised on site that it will not fit. How wide will the new joist have to be to provide the same resistance against bending? (12.5 marks)

3. Using graphs provided sketch shear force and bending moment diagrams and calculate and locate maximum values using given formulas, for the beam shown below. Carry out the calculations for **design** (not characteristic) loading. (12.5 marks)



4. List the most common modification coefficients in timber design and explain how and where they are used in the design and what influence they may have on the size of the beam. (12.5 marks)

5. Describe all three modes of failure of retaining walls and state briefly what should be done to prevent them. (12.5 marks)

6. (a) Describe how it is ensured that deflection in RC beams is not excessive, as there is no separate formula to calculate what the value of the max. deflection is (unlike timber and steel) (5.5 marks)

(b) Describe how to calculate the size (diameter) and spacing of links (stirrups) in RC beams. (7 marks)

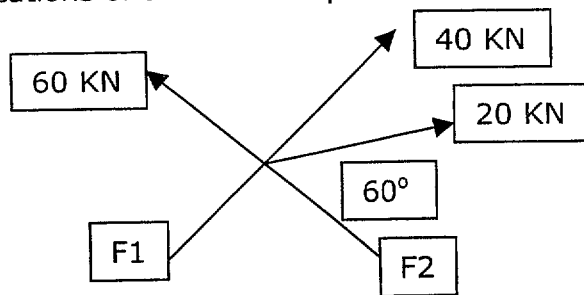
7. Describe the stages in the conservative method of designing steel beams. (12.5 marks)

8. (a) Composite floors (metal decking on steel frame) - describe the role of the shear studs in the composite construction and what implication it has on the design and size of the composite section when omitted. (7 marks)

(b) List the advantages and disadvantages of using composite construction when the structure is that of steel frame. (5.5 marks)

9. Describe the typical materials and methods of construction for displacement and replacement piles. (12.5 marks)

10. Resolve the truss joint (given below) for the unknown forces in marked members (value of the force and state if tensile or compressive). Comment on what assumptions are made in truss design and identify the implications of these assumptions.



(12.5 marks)

11. Identify the engineering characteristics of cohesive and cohesionless soils and outline their influence on shallow and deep foundations. (12.5 marks)

END OF PAPER