[OCD161]

UNIVERSITY OF GREATER MANCHESTER

OFF CAMPUS DIVISION

WESTERN INTERNATIONAL COLLEGE, RAS AL KHAIMAH

BENG(HONS) CIVIL ENGINEERING

SEMESTER ONE EXAMINATION 2025/2026

SUSTAINABLE CONSTRUCTION AND MATERIALS 1

MODULE NO: CIE4019

Date: Tuesday 20th January 2026 **Time: 10:00am – 11:30am**

INSTRUCTIONS TO CANDIDATES:

There are FIVE (5) questions on this paper.

Answer any FOUR (4) questions.

Marks for parts of questions are shown in the brackets.
This examination paper carries a total of 100 marks.

All working must be shown. A numerical solution to a question obtained by programming an electronic calculator will not be accepted.

Attach pages 3 & 5 with the answer script.

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Module No. CIE4019

Q1

A new two-storey commercial building is proposed to be constructed on a vacant plot of land near the waterfront area of Ras Al Khaimah. The site was previously used as an open storage yard for construction materials. The proposed structure will include a basement for parking, which requires excavation up to 4 metres below ground level.

The client has requested a comprehensive site investigation to assess the suitability of the ground conditions for the proposed works

a) What will be the main concerns in the site investigation for the proposed works?

(10 marks)

b) Describe the main stages involved in carrying out the site investigation for the proposed commercial building.

(10 marks)

c) Explain why testing soil samples is important to determine the bearing capacity in construction projects.

(5 marks)

[TOTAL 25 MARKS]

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Q2

a) Explain the importance of controlling ground movement such as shrinkage, swelling, or frost heave when designing foundations.

(10 marks)

b) **Figure 1** shows simple schematics of different foundation types. Identify the type of foundation depicted and comment on its typical applications and suitability.

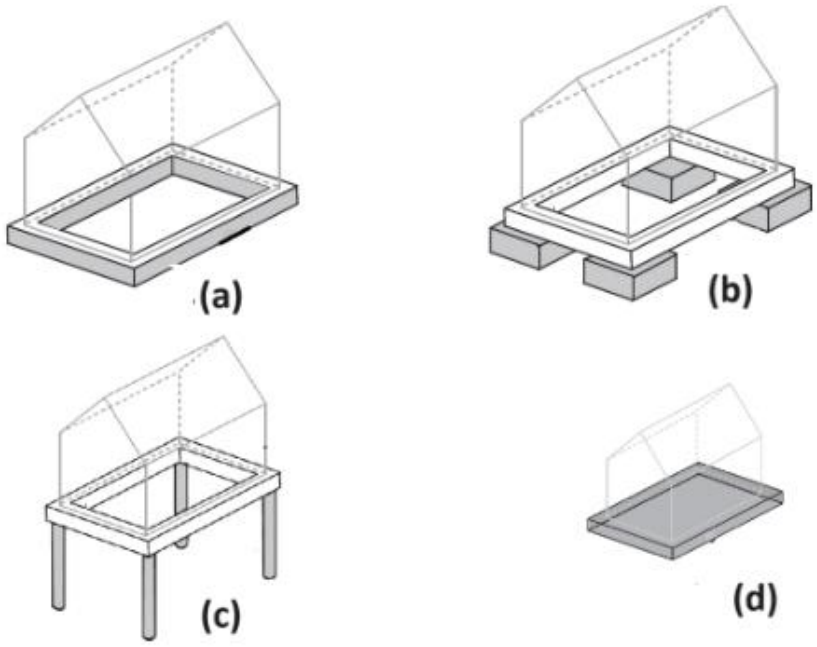

Figure 1: Simple schematics of foundation types

(15 marks)

[TOTAL 25 MARKS]

Please turn the page

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Q3

During the construction of a two-storey residential house, the builder notices that moisture is rising through the walls from the foundation, causing patches and peeling paint on the ground floor. To prevent further damage, the engineer recommends installing a damp-proof course (DPC) at suitable levels in the structure. The selection of proper DPC materials is important to ensure long-term protection against dampness and structural decay.

a) What is meant by a damp-proof course (DPC) in building construction?

(8 marks)

b) List and describe any four materials commonly used for a damp-proof course.

(7 marks)

c) Draw and neatly label a section of a solid concrete ground floor, showing the correct position of the damp-proof membrane (DPM), insulation, and other key layers.

(10 marks)

[TOTAL 25 MARKS]

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Q4

a) List out the functional requirements of wall that must be considered during the design and construction of a building.

(10 marks)

b) **Figure 2** shows different types of brick bonds used in wall construction. Identify each bond and comment on its characteristics and typical use.

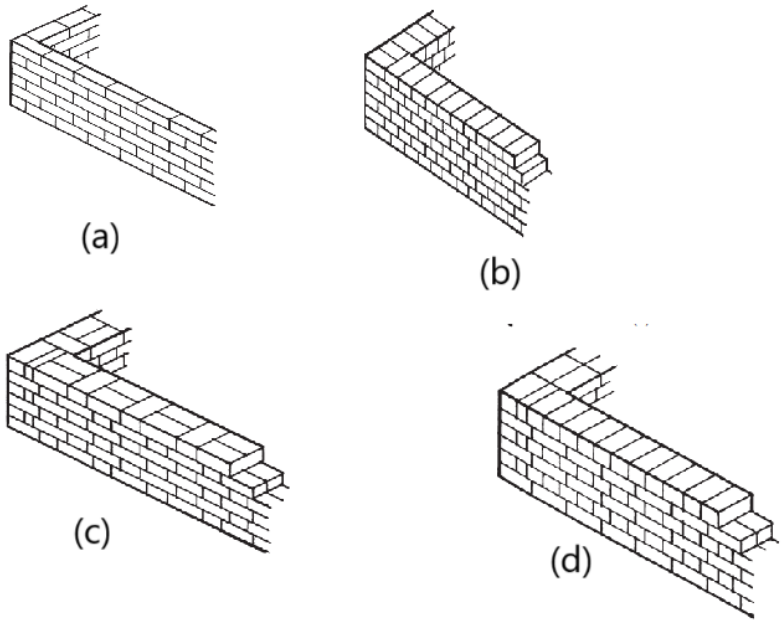

Figure 2: Different types of brick bonds

(15 marks)

[TOTAL 25 MARKS]

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Q5

a) List the key properties of fresh concrete and explain their significance.

(10 marks)

b) Define curing and explain its significance in concrete construction.

(5 marks)

c) A circular steel rod of 16 mm diameter and 500 mm length is subjected to a tensile force of 40 kN. Given that the modulus of elasticity (E) for steel is 200 kN/mm², calculate the stress induced in the rod, strain and elongation of the rod due to the applied load.

(10 marks)

[TOTAL 25 MARKS]

END OF PAPER