

UNIVERSITY OF BOLTON
WESTERN INTERNATIONAL COLLEGE FZE
BENG (HONS) CIVIL ENGINEERING
SEMESTER ONE EXAMINATION 2019/2020
CONSTRUCTION AND MATERIALS TECHNOLOGY
MODULE NO: CIE4008

Date: Wednesday 15th January 2020

Time: 1.00pm to 4.00pm

INSTRUCTIONS TO CANDIDATES:

There are **SIX** questions in this paper

Answer **ANY FOUR** questions from Section A and **ALL** questions from Section B.

Answer Section A and Section B questions in separate answer books.

All questions carry equal marks.

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.

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SECTION A

Question 1

Scenario

A developer has purchased a site at Jazeera, Ras Al Khaimah, United Arab Emirates for the proposed construction of two-storey town houses. A geotechnical investigation, comprising boreholes of 20.0m depth and supplementary field testing was performed at the site. At the time of investigation the plot was undeveloped and the level of the site was approximately at the same level to the adjacent road. The borehole log which contains the details of the subsoil conditions at a site are shown in Figure Q2 together with the details of the soil properties up to a depth of 12m.

- (a) For the above scenario, explain where you could obtain relevant information about the site's history you need to consider, referring to the appropriate organisations for sources of information to help you make an informed decision.

(12 marks)

- (b) During the period of site works, groundwater was encountered on this site at a depth of 3m. If the natural water table level is at about 3 m depth from the ground level over the entire area, what procedures should be adopted during construction.

(8 marks)

Total 20 marks

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Question 2

- (a) Suggest the most appropriate foundation system for the sub-soil conditions by analysing the borehole details provided in Figure Q2 below. Using well annotated sketches, discuss the different types of load transfer system that occur in the foundation. Compare the possible foundation options for the given site condition by evaluating the possible risks.

(10 marks)

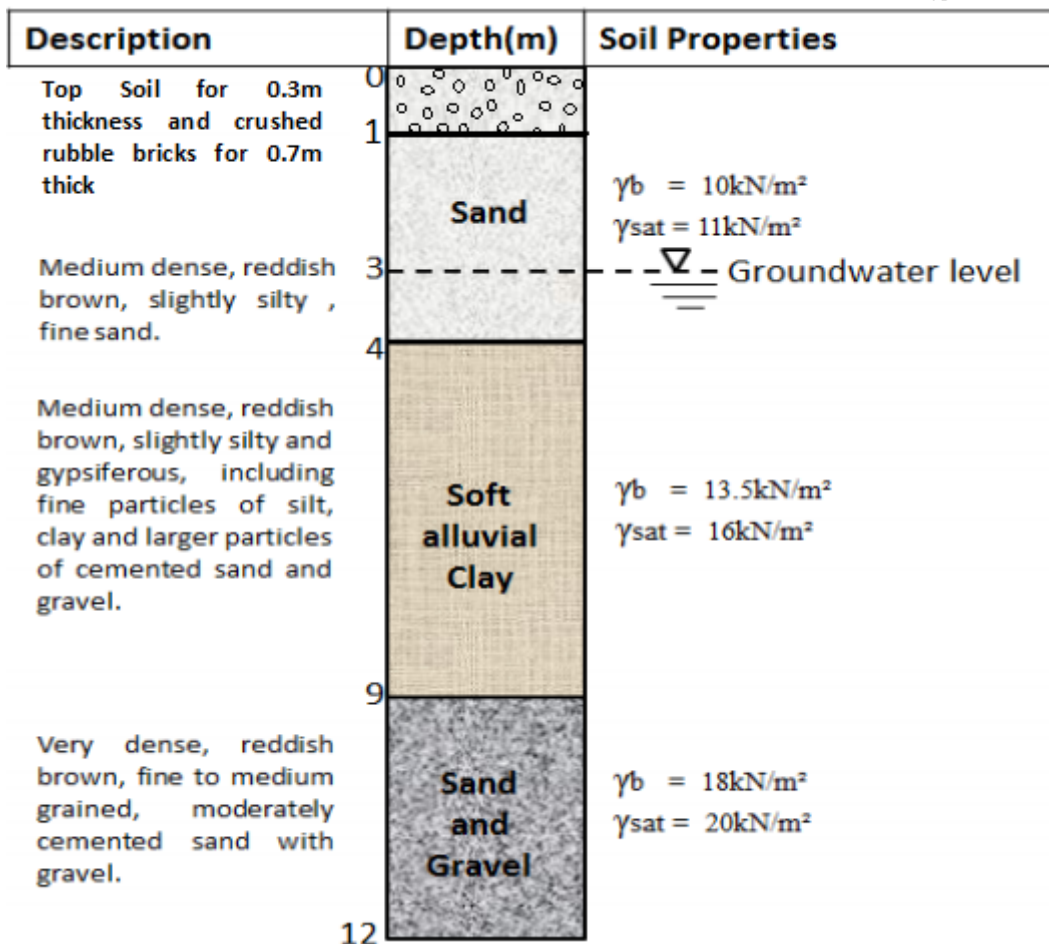


Figure Q2. Borehole log details

Question 2 continued over the page...

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Question 2 continued...

- (b) Describe in detail the type of flooring which can be provided for this site condition. Describe the main components of the floor which can be used and illustrate your answer with annotated sketch. Explain the purpose of each layer in this system listing the various materials which can be used

(10 marks)

Total 20 marks

Question 3

- (a) Among the external walls shown in Figure Q3, which of them is the most common form of moisture-resisting option. Explain the principle behind it.

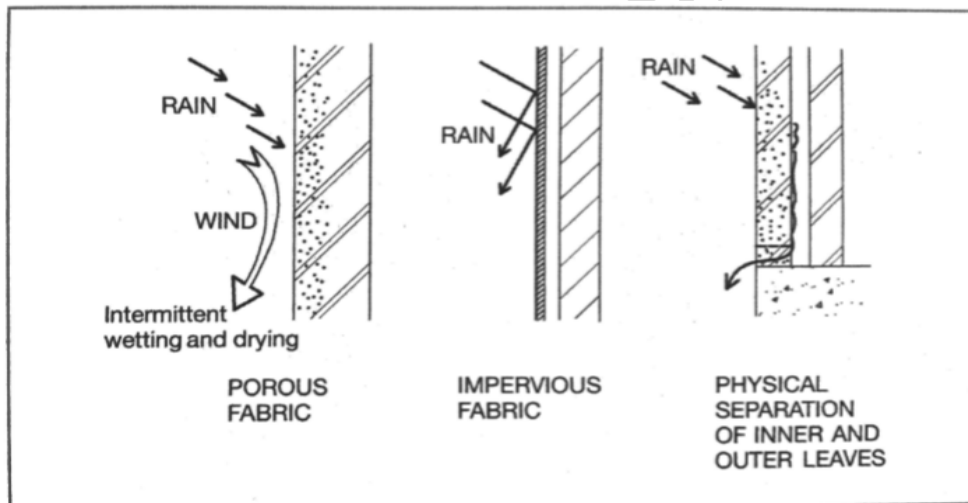


Figure Q3: External Walls – Moisture resisting Options

(5 marks)

- (b) Draw a section through a brick / block cavity wall including a brief specification of the materials to comply with the latest Building Regulations. Explain the function of each component part of the wall.

(15 marks)

Total 20 marks

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Question 4

- (a) Sketch the typical details of a steel framed distribution warehouse, at the beam to column joint specifying the important functions of each unit. (8 marks)
- (b) Describe the functional requirements of staircase. (5 marks)
- (c) Explain why the staircase provided in the residential house whose ground floor plan is shown in Figure Q4 was selected over the other staircase designs. Also mention if any alternative staircase design could have been provided instead of the one used. (7 marks)

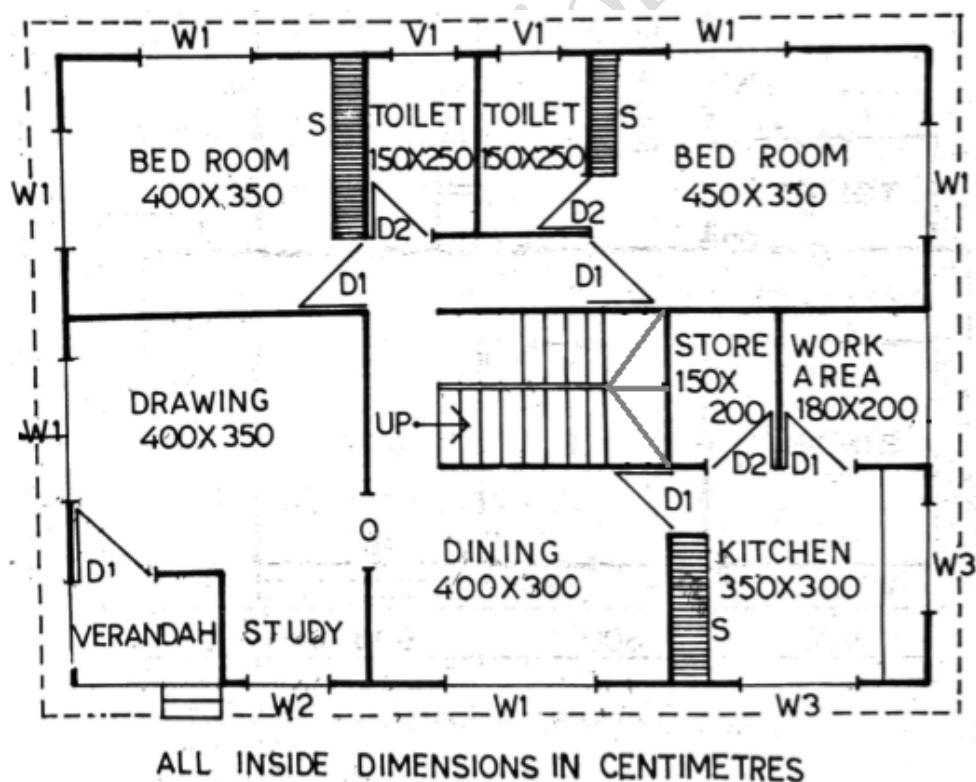


Figure Q4: Ground floor plan of a residential house

Total 20 marks

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Question 5

(a) Explain how a truss rafter roof system can span greater distance without using load bearing walls.

(5 marks)

(b) Draw a section through a truss rafter roof at the eaves level annotating all the component parts.

(10 marks)

(c) List the advantages of using truss rafter roof in the construction to a traditional cut roof for two storey houses.

(5 marks)

Total 20 marks

END OF SECTION A

Please turn the page for SECTION B

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SECTION B

Question 6

(a) Sketch and discuss the typical stress strain plot for mild steel highlighting the following key points.

- i. Elastic region
- ii. Plastic region
- iii. Yield point
- iv. Fracture

(12 marks)

(b) Using sketches explain the tensile failure mode of mild steel.

(4 marks)

(c) A mild steel bar having a 50mmx50mm square cross section is subjected to a tensile load of 400KN. The bar length is 250mm and the change in longitudinal dimension is 0.193mm.

Determine

- i. Stress generated and corresponding strain
- ii. The modulus of elasticity

(4 marks)

Total 20 marks

END OF SECTION B

END OF PAPER