

**UNIVERSITY OF BOLTON**

**SCHOOL OF THE BUILT ENVIRONMENT &  
ENGINEERING – RAK CAMPUS**

**BSc(HONS) ARCHITECTURAL TECHNOLOGY  
BSc(HONS) BUILDING SURVEYING AND PROPERTY  
MANAGEMENT**

**BSc (HONS) CIVIL ENGINEERING**

**BSc (HONS) CONSTRUCTION**

**BSc(HONS) CONSTRUCTION MANAGEMENT**

**BSc(HONS) QUANTITY SURVEYING AND  
COMMERCIAL MANAGEMENT**

**SEMESTER ONE EXAMINATION 2009/2010**

**CONSTRUCTION AND MATERIALS TECHNOLOGY**

**MODULE NO: BLT1003**

Date: Monday 18 January 2010

Time: 2.00 pm – 5.00 pm

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**INSTRUCTIONS TO CANDIDATES:**

There are SIX questions.

Answer ANY FIVE questions.

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

All questions carry equal marks.

All working must be shown.

Marks for parts of questions are shown in brackets.

All answers should include reference to relevant aspects of health and safety in construction and well annotated sketches.

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**SECTION A**

- 1a Discuss the procedures and controls that must be applied for the satisfactory transport to site and storage on site of trussed rafters to ensure that they do not suffer damage or deformation prior to fixing.
- (10 Marks)

- 1b Describe at least THREE advantages and THREE disadvantages of trussed rafter roofs and traditional cut roofs formed on site.
- (10 Marks)

**Total 20 Marks**

- 2 Piled foundations transfer the load from buildings into the ground in two different ways.
- Explain with the use of detailed well-annotated sketches each of these two load transfer systems.
- (5 marks each description)  
(5 marks for sketch of each type)

**Total 20 Marks**

- 3a With reference to annotated sketches identify and describe the structural features included in a domestic dwelling to ensure that the external walls are provided with sufficient lateral restraint.
- (10 Marks)

- 3b Sketch, annotate and fully describe a cross section through a suspended timber floor at its junction with a traditionally built external wall. Your sketch should include details of a strip foundation and include all important principle dimensions.
- (10 Marks)

**Total 20 Marks**

**Please turn the page**

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 BSc(Hons) in AT/BSPM/CIV/CON/CM/QSCM  
 Semester One Examination 2009/2010  
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 Module No. BLT1003

### SECTION B

4

- (a) The pores in masonry materials exhibit capillary action when exposed to moisture. This process can lead to problems such as rising damp in buildings or other water borne degradation problems. The following results were obtained from a laboratory experiment carried out to measure the water absorbed by capillary action for two types of masonry units.

**Table 4-1: Physical properties of masonry units**

	Concrete masonry unit	Clay masonry unit
Length (mm)	216	214
Width (mm)	99	103
Depth (mm)	66	65
Dry mass (g)	3086.2	1921.4

**Table 4-2: Water absorption by capillary action**

Time (minutes)	Concrete masonry unit	Clay masonry unit
	Mass (g) at time t	Mass (g) at time t
1	3110.2	1939.4
2	3114.3	1945.1
3	3116.6	1949.2
4	3118.5	1953.5
5	3120.3	1956.7
10	3128.6	1971.2
20	3137.9	1989.8
30	3146.2	2004.6

- (i) Calculate the initial rate of absorption expressed in ( $\text{g cm}^{-2} \text{min}^{-1}$ ) for each masonry unit.

(4 Marks)

- (ii) Plot a graph of the mass of water absorbed (g) against the square root of time ( $\text{min}^{0.5}$ ) for each specimen and use this graph to determine the water absorption coefficient ( $\text{g cm}^{-2} \text{min}^{-0.5}$ ) for each masonry unit.

(7 Marks)

**Question 4 continued over the page...**

School of the Built Environment & Engineering – RAK Campus  
 BSc(Hons) in AT/BSPM/CIV/CON/CM/QSCM  
 Semester One Examination 2009/2010  
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 Module No. BLT1003

**Question 4 continued**

- (iii) Compare the water absorption behaviour of these two masonry units and discuss its implication on the utilisation of these two types in certain applications in construction.

(3 Marks)

- (b) Seasoning of timber has great effects on its strength and quality. Describe and compare two methods of seasoning of timber.

(6 Marks)

**Total 20 Marks**

5

A normal strength concrete of low to medium workability is to be used as base slab foundations. The concrete must achieve a compressive strength of  $30\text{N/mm}^2$  after 28 days, as stated in the contract specification. During the construction samples were taken from the fresh concrete in a container. The dimensions and weight of the container are given in Table 5-1. The container was filled with concrete to the top surface without compaction and then the concrete was fully compacted using a vibrating table. The distance “s” from the surface of the compacted concrete to the upper edges of the container was measured from four sides of the container and the values are given in Table 5-2. Three 150mm cube specimens have been prepared for compression test.

**Table 5-1: Dimensions and weight of the container**

Height	Length	Width	Weight
mm	mm	mm	g
400	200	200	5650

**Table 5-2: Distance “s”**

Distance “s” mm			
s1	s2	s3	s4
34	34	37	35

- (a) Given that the weight of the container after compaction of concrete was 40.69 kg, calculate the wet density of the compacted concrete, expressed in  $\text{kg/m}^3$

(5 marks)

**Question 5 continued over the page...**

School of the Built Environment & Engineering – RAK Campus  
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 Module No. BLT1003

**Question 5 continued**

- (b) After 28 days of curing, three cubes have been tested under compression and the failure loads were 695, 701 and 719 kN. Does this concrete fulfil the requirements of the contract?

(5 Marks)

- (c) Identify four chemical compounds resulting from the hydration of cement and discuss their relative contribution to the strength development of the concrete.

(10 Marks)

**Total 20 Marks**

6

- (a) Describe the characteristics of wet and dry rot and make reference to optimum growth conditions of both types of fungi.

(8 Marks)

- (b) A tensile test on a high tensile steel reinforcement bar produced the following results:

Load (kN)	Extension (mm)
0	0
10	0.02292
20	0.04698
30	0.07116
40	0.09344
50	0.11615

Other data		
Overall length	=	450 mm
Mass	=	384 g
Density	=	7850 kg/m <sup>3</sup>
Test length	=	50 mm
Yield load	=	59.2 kN
Ultimate load	=	74.4 kN

- (i) Using the above information, sketch and fully annotate the complete stress: strain curve that you would expect to be produced from this tensile test, inserting significant stress values from the test data.

(8 Marks)

- (ii) Determine the average value of Young's Modulus of Elasticity for this type of high yield steel. Comment on the value obtained, and compare it with that to be expected of mild steel.

(4 Marks)

**Total 20 Marks**

**END OF QUESTIONS**