

**UNIVERSITY OF BOLTON**

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

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

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

**SEMESTER ONE EXAMINATION 2010/2011**

**BUILDING AND ENVIRONMENTAL TECHNOLOGY**

**MODULE NO: BLT2002**

Date: Tuesday 18 January 2011

Time: 6.00 pm – 9.00 pm

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**INSTRUCTIONS TO CANDIDATES:**

There are SIX questions.

Answer ANY FIVE questions from Section A and B.

All questions carry equal marks.

Marks for parts of questions are shown in brackets.

Use one answer book for questions from Section A and one answer book for questions from Section B.

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School of the Built Environment & Engineering – RAK Campus  
BSc(Hons) AT/BSPM/CM/QSCM  
Semester One Examination 2010/2011  
Building and Environmental Technology  
Module No. BLT2002

### **SECTION A**

#### **Questions 1,2,3 in section A only relate to the development of a proposed six storey office block**

#### **Scenario**

A six storey office block of contemporary design is to be constructed in the middle of a city centre. The office block is to include a basement that will be used as an archive store for important legal documents. The superstructure consists of steel frame construction, sustainable flat roof and modern contemporary envelope system. The office block is not connected to any existing buildings but is surrounded by busy city centre roads with other multi-storey blocks on the opposite side of the roads.

1. The subsoil ground conditions consist of 2000mm of fill consisting of brick rubble from a former Victorian building. Below which is a soft layer of shrinkable clay approximately 2500mm deep. Gravel is reached at 4500mm below the ground and is approximately 8000mm deep across the whole site. The water table is at 2500mm below the ground level. Formation level is 5000 mm below ground level.
  - a. Discuss a suitable proposal for the basement construction in relation to the subsoil conditions, site location and proposed use as an archive storage area in the basement.

(10 marks)
  - b. Draw a detailed section through the basement wall and floor construction for the proposal discussed in (a) showing all details of construction including methods of ground water exclusion.

(10 marks)

**Total 20 marks**

**Please turn the page**

School of the Built Environment & Engineering – RAK Campus  
BSc(Hons) AT/BSPM/CM/QSCM  
Semester One Examination 2010/2011  
Building and Environmental Technology  
Module No. BLT2002

2. The office development is to be constructed using a hot rolled steel frame structure.
- a. Discuss the merits of using steel frame construction for the proposed office development.

(10 marks)

- b. Explain with the aid of sketches two methods that can be employed to provide lateral wind restraint to the six storey steel frame office block.

(10 marks)

**Total 20 marks**

**Please turn the page**

School of the Built Environment & Engineering – RAK Campus  
BSc(Hons) AT/BSPM/CM/QSCM  
Semester One Examination 2010/2011  
Building and Environmental Technology  
Module No. BLT2002

3. a. Discuss four options that could be used to construct the floors of the office block comparing the advantages and disadvantages of each option.

(10 marks)

- b. Produce drawn details through two types of floor construction discussed above. Drawing should be fully annotated showing all component parts in the correct location.

(10 marks)

**Total 20 marks**

**Please turn the page**

School of the Built Environment & Engineering – RAK Campus  
BSc(Hons) AT/BSPM/CM/QSCM  
Semester One Examination 2010/2011  
Building and Environmental Technology  
Module No. BLT2002

**SECTION B**

4. a. Explain how electricity is generated and transmitted to the final user. Within your answer you must provide a block diagram that illustrates a typical distribution network.

(10 marks)

- b. Discuss the advantages and disadvantages of using micro-generation to provide an electrical supply to an average domestic property in the UK.

(10 marks)

**Total 20 marks**

5. a. Under what circumstances may drains and sewers become damaged during their construction and service period?

(6 marks)

- b. With the aid of sketches describe the materials and jointing techniques for the pipework used to provide underground drainage.

(6 marks)

- c. Name and state the three available methods of testing underground drainage. Select one of the test methods and, with the aid of sketches, describe how the test is undertaken along with any precautionary measures.

(8 marks)

**Total 20 marks**

**Please turn the page**

School of the Built Environment & Engineering – RAK Campus  
 BSc(Hons) AT/BSPM/CM/QSCM  
 Semester One Examination 2010/2011  
 Building and Environmental Technology  
 Module No. BLT2002

6. Using the information provided in the tables below find the rating, in Watts (W), of the heat emitter required to heat the lounge of the bungalow shown in Figure 1. Consider the external temperature to be  $-1^{\circ}\text{C}$ .

**20 marks**

<b>Construction</b>	<b>U Value (<math>\text{W}/\text{m}^2\text{ }^{\circ}\text{C}</math>)</b>
External solid wall	2.0
External cavity wall	1.0
External cavity wall (filled)	0.5
External timber wall	0.6
Internal wall	2.2
Door	4.0
Single glazing	5.7
Double glazing	3.0
Ground floor, solid	0.45
Ground floor, timber	0.62
Intermediate floor, heat flow up	1.7
Intermediate floor, heat flow down	1.5
Flat roof	1.5
Pitched roof (100mm insulation)	0.34
Pitched roof (no insulation)	2.2

**Table 1 – Approximate U Values through building fabric**

**Question 6 continued over the page...**

School of the Built Environment & Engineering – RAK Campus  
BSc(Hons) AT/BSPM/CM/QSCM  
Semester One Examination 2010/2011  
Building and Environmental Technology  
Module No. BLT2002

**Question 6 continued**

<b>Room</b>	<b>Ventilation rate (air changes per hour)</b>
Living	1.5
Dining	1.5
Bedroom	1.0
Hall / landing	1.5
Bathroom	2.0
Toilet	2.0
Kitchen	2.0

**Table 2 – Ventilation rates**

**Question 6 continued over the page...**

School of the Built Environment & Engineering – RAK Campus  
 BSc(Hons) AT/BSPM/CM/QSCM  
 Semester One Examination 2010/2011  
 Building and Environmental Technology  
 Module No. BLT2002

**Question 6 continued**

**Formula sheet - Radiator sizing (Question 6)**

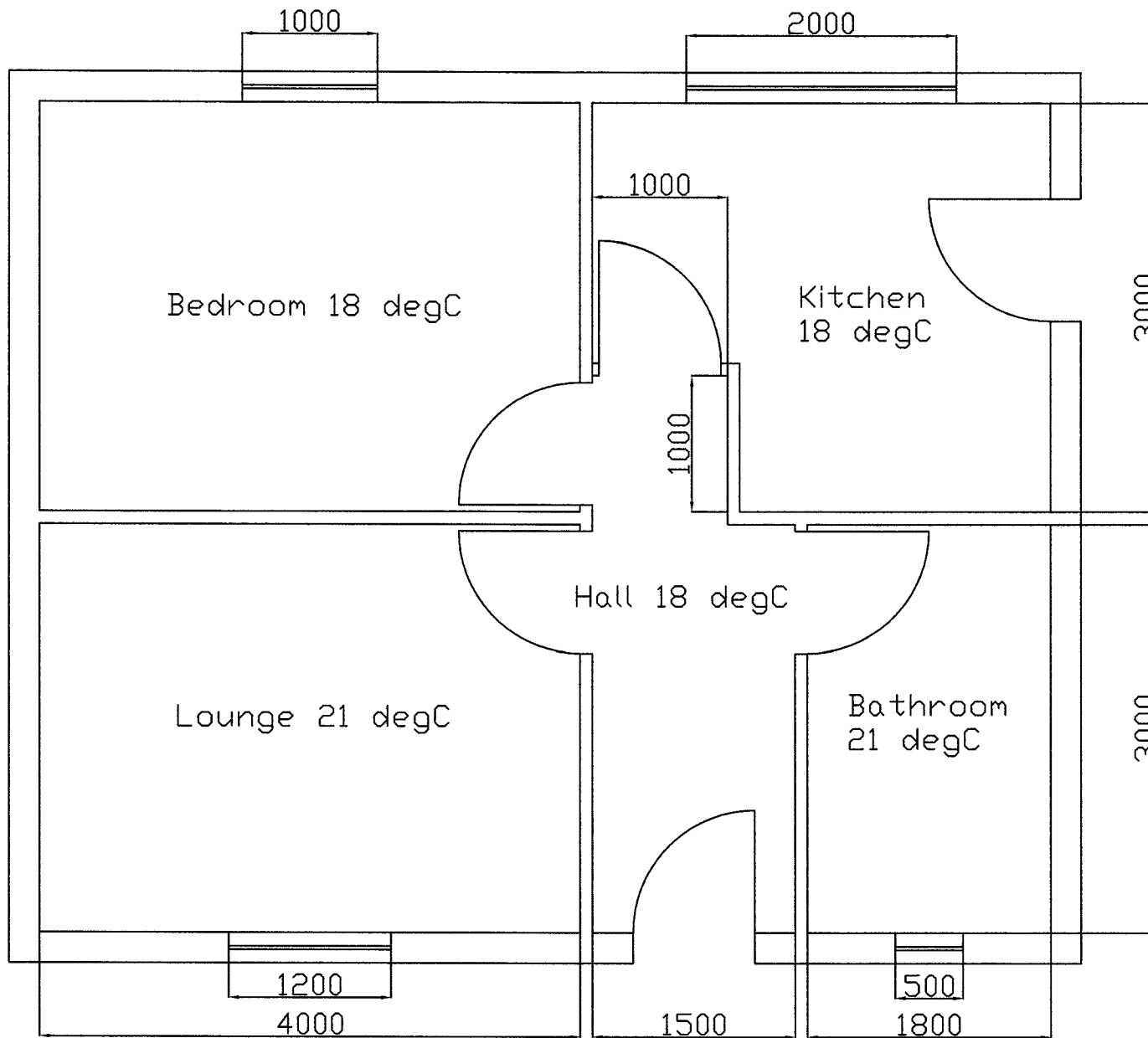
**Fabric losses**

$$\begin{array}{ccccccc} \text{Surface} & & \text{Temperature} & & \text{U value} & & \text{Heat loss} \\ \text{area} & \times & \text{difference} & \times & & = & \\ (\text{m}^2) & & (\text{°C}) & & (\text{W/m}^2 \text{ °C}) & & (\text{W}) \end{array}$$

**Ventilation losses**

$$\begin{array}{ccccccc} \text{Volume} & & \text{Air change} & & \text{Temperature} & & \text{Ventilation} & & \text{Heat loss} \\ \text{of room} & \times & \text{rate} & \times & \text{difference} & \times & \text{Factor} & = & \\ (\text{m}_3) & & (\text{per hour}) & & (\text{°C}) & & (0.33 \text{ W/m}^3 \text{ °C}) & & (\text{W}) \end{array}$$

**END OF QUESTIONS**



### **Construction details**

All dimensions are in mm

Solid external brick wall

Solid floor

Single glazed windows

100mm of insulation in roof space

Room heights 2400mm

Door area 2 sqm

Window height 800mm

**Figure 1**