2011 Architectural Technology

Higher

Finalised Marking Instructions

SECTION A

Attempt all questions in this Section (total 40 Marks)

Marks

1. State **two** *financial constraints* that would have to be considered before undertaking a building development project.

Sources of funding – working capital, borrowing.
Costs – land, building cost, overheads, loan interest.
Profit margin – for developer, contractor, lender.

One mark for each or any reasonable answer. **2**

2. A company has applied for a *Building Warrant* for a housing project. State how long the Warrant lasts and what action needs to be taken if the building is not completed before the Warrant expires.

Three years and reapply/resubmit application.

One mark for each. **2**

3. When surveying on a construction site briefly describe the main safety hazard when using the Staff.

Due to the length that the staff can extend, it is possible that it may strike live overhead electrical cables.

One mark for extension and one mark for striking electrical cables. **2**

4. State **four** factors to be considered when selecting a suitable material for a roof covering.

Local weather conditions, surrounding buildings, local building regulations, type of building, durability, roof design, roof loading (imposed, dead, wind), cost.

One mark for each or any reasonable answer. **4**

5. Briefly describe **two** aesthetic factors that will influence the design of a new building.

Visual appearance, looks, visual appeal, architectural style. Colour, shape, form, contrast, tone, texture.

Any two for two marks each. **4**

6. During a linear survey a slope was taped and two measurements taken. The first reading taken was 22.509m with a slope of 7º, whilst the second reading was 35.543m and a slope of 5º. Calculate the horizontal length of the slope.

Correct formula Cos = a/h

Length a = Cos 7^o x 22.509 = 22.341

Length b = Cos 5^o x 35.543 = 35.408

Total horizontal length = 22.341 + 35.408 = 57.749

One mark for each of the above. **4**

Marks

7. Briefly describe, with the aid of an annotated sketch, the difference between the *True Origin* and the *False Origin* in relation to the National Grid.

True origin runs approximately through the centre of the country at 2º West 49º North. Using this would result in grid co-ordinates to the west of this point being a negative value and some parts of the mainland to the north having values over 1000km.

If this origin is moved northwards and westwards by 100km and 400km respectively to a false origin all points on Great Britain's grid are a positive value and less that 1000km, given by easting and westing grid co-ordinates.

Sketch two marks and two good points on true/false origin one mark each. **4**

8. *Offsetting* and *Trilateration* are **two** techniques used in linear surveying. Briefly describe how **each** technique is used.

Offsetting and Trilateration are both used to fix topographical and manmade features relative to a survey line or framework.

Measurements for both are recorded using the double line booking method.

Offsets are made at right angles to the survey line being worked on.
They are made at small distances of up to five metres from the survey line.
They are fixed by two measurements, one along the survey and the other at right angles to it.
The right angle is judged by eye.
From a series of offsets the shape of a field boundary, wall footpath etc can be plotted later on.

Trilateration is used when the object being surveyed is above 5m from the survey line.
Measurements are recorded by a series of triangles in which all the lengths of the sides are known.
The base of these triangles has two measurements along the survey line and a further measurement from each of these points.
Each point fixed by trilateration therefore requires four measurements to be taken.

One mark for each point taken from above. **8**

Marks

9. List **six** items which should be contained in a contouring survey report for presentation to the client.

Who – has written the report, carried out the survey (team members)

When – was the report created

Where – was the survey carried out

What – is the report name and its purpose, equipment was used, was the outcome of the survey, procedure was followed in the survey

Why – was the survey carried out

Are – any drawings required, any calculations included

One mark for each valid item **6**

10. Briefly describe **one** method of providing fire protection in a small domestic building.

Ease of escape in event of a fire – doors opening in the correct direction, correct design of window openings, passages and corridors providing an escape route suitable for quick exit, easy escape from all areas of building particularly upper floors, adequate alarms. Occupants should be able to turn away from the fire and have an alternative means of escape. Corridors and stairways are important areas leading to a place of safety and should give good resistance to fire and afford protection to people exiting.

Materials – fire resistant/non-combustible materials such as brick, steel and concrete in all.

Compartmentalisation – dividing spaces inside the building which are separated by fire resisting compartment walls and floors. This aims to prevent the rapid spread of the fire which should be contained within the space where it originates.

Fire fighting equipment and the use of sprinkler systems. Hard wired alarms. Fire hydrants close to buildings, ease of access for firemen.

Consideration of buildings where multiple residences are in close proximity should restrict the spread of fire to adjoining properties. **4**

(40)

[END OF SECTION A]

SECTION B

Attempt any TWO questions in this Section (total 60 Marks)

Marks

11. Refer to the scale 1:1250 Ordnance Survey Superplan Sheet NS5965SW and answer the following questions.

(a) Describe **four** details on plan square NS593651.

Glassford Street runs from N to S with Wilson Street forming a junction at approximately 25m from the southern end of the grid square. To the eastern side of this junction there is a disused PC (Public Convenience) and a Telephone Call Box. The large square block of buildings located slightly to the east of the block contains three Public Houses (PH). To the block of buildings to the northwest there is an electricity substation.

Any four correct items identified one mark each. **4**

(b) Identify the building that has the 10m grid reference NS59326539.

War memorial **2**

(c) Determine the average gradient of George Square between North Frederick Street and South Frederick Street.

$$\frac{12{\cdot}3m - 11{\cdot}2m}{88m} = 1:80 \text{ OR } 0{\cdot}0125$$

1 mark correct spot levels,
2 marks correct formula
1 mark correct answer **4**

(d) Briefly describe **two** functions of the walls of a building.

Provide strength and stability, provide enclosure, control the internal environment, prevent heat loss, fire protection, architectural character, protection from the elements, durability and low maintenance.

2 marks each correct answer. **4**

(e) Briefly describe, with the aid of annotated sketches, **two** common forms of domestic wall construction currently in use in the UK. Include an explanation of the construction methods and materials used in each form.

The two main construction methods used in domestic construction are Traditional Construction and Timber Frame Construction. Both methods of construction use a cellular structural form. The structural and enclosure elements of Traditional Construction are formed in masonry whilst in Timber Frame they are constructed in structural timber with a facing of masonry.

Sketches should show the different methods.

1 mark for each method
3 marks for each sketch **8**

Marks

(f) In the two forms of construction identified in Question 11(e) state **one** advantage and **one** disadvantage for **each** form of construction.

Traditional –	*advantage –*	*small builders, public confidence, solid feel, customise/personal specifications.*
	disadvantage –	*cost, labour, slow, slow drying, high waste levels, more difficult to meet insulation levels.*
Timber frame –	*advantage –*	*speed of construction, economy, reduced dead load, high μ values, low waste.*
	disadvantage –	*difficult to modify, poor sound insulation, poor fire resistance, unknown longevity.*

4

(g) Buildings are designed to carry loads from different sources. Identify and briefly describe **two** sources of these loads.

Wind loads, pressure and suction.
Imposed loads, occupancy and roof loads.
Dead loads, materials of building.

4

(30)

Marks

12. (a) **Figures Q12 1** and **Q12 2** show a site plan and a floor plan for a proposed domestic building.

(i) Briefly describe the site.

The site has six sides and encompasses a hill to the east which has an elevation of over 38 metres. The hill slopes down to an elevation of 32 metres to the west. The site is approximately twice as long in the East/West axis as it is in the North/South. **4**

(ii) On **Worksheet Q12 1** draw a cross-section of the site which runs from east to west and crosses the highest point.

Correct axis 1 mark
reasonable scale 1 mark
appropriate levels 2 marks
good quality sketch 2 marks **6**

(iii) Explain where you might position the building giving reasons for your choice.

Consideration of orientation, shape of site, shape of house, access etc. **6**

(b) Before any building project begins it is important to assess the environmental impact that it will have. State **four** factors that should be considered in an environmental assessment of a proposed building project.

Site usage, impact on existing environment, impact during construction, natural environment, etc. **4**

(c) Briefly describe **two** methods to improve the μ values of a house that is being renovated.

Insulation of roof area, double/triple glazing, under floor insulation, cavity wall, wood cladding, etc. One mark for each method, one mark for description. **4**

(d) Briefly describe **each** of the roles of the *Planning Department* and *Building Control Department* of the local authority.

Planning – concerned with planning through policies and plan set out by local authorities. Gives permission to build after consideration of land use, effects of development on local amenities and the environmental impact

Building Control – standards of building, health and safety, use of energy, compliance with current standards. **6**

(30)

Marks

13. (a) **Figure Q13** shows a set of levels taken during a survey of a construction site.

Using **Table Q13:**

(i) book the levels; **5**
(ii) reduce the levels using an appropriate method; **5**
(iii) carry out an appropriate arithmetic check on the reduction; **2**
(iv) state the magnitude of the closing error in the survey and suggest a reason for this error. **2**

Back Sight	Intermediate Sight	Fore Sight	Ht of Collimation Or Rise & Fall		Reduced Level	Remarks
2.906					9.651	**OBM**
	2.122		0.784		10.435	
	1.738		0.384		10.819	
2.014		2.775		1.037	9.782	
		1.580	0.434		10.216	**10.238**
4.920		4.355	1.602	1.037	0.565	
4.355			1.037			
0.565			0.565			

Back Sight	Intermediate Sight	Fore Sight	Ht of Collimation Or Rise & Fall	Reduced Level	Remarks
2.906			12.557	9.651	**OBM**
	2.122			10.435	
	1.738			10.819	
2.014		2.775	11.796	9.782	
		1.580		10.216	**10.238**
4.920		4.355		0.565	
4.355					
0.565					

Magnitude of error 0.022mm correct for 1 mark and reason for 1 mark. Incorrect reading of staff, level not true, transcription error, level movement, any reasonable answer.

Marks

(b) Briefly describe **two** important properties of **each** of the following materials used in the construction of domestic buildings.

(i) Facing bricks.

Strength, durability, appearance, water resistance, fire resistance, poor thermal resistance **2**

(ii) Expanded polystyrene.

Low density, good thermal resistance, poor fire resistance.

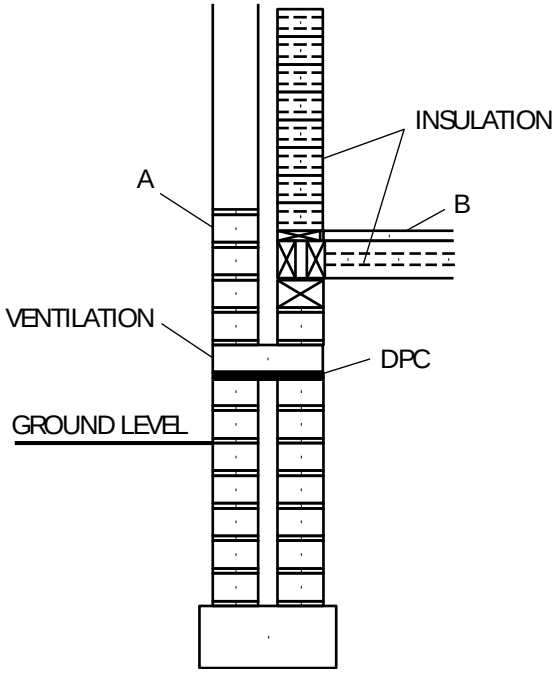
One mark for each correct answer **2**

(c) **Worksheet Q13(c)** shows the incomplete detail drawing for the foundation and substructure of a domestic building. On the worksheet:

(i) Identify items A and B;

A – External cavity wall / B – Flooring grade chipboard. **3**

(ii) sketch the DPC, ventilation and thermal insulation requirements.



3

Marks

(d) Identify and briefly explain **three** ways a building development can comply with guidelines on sustainability.

The potential impact on the environment of proposed developments, both good and bad, must be considered prior to commencing any building project.

Environmental issues such as the reduction of greenhouse gas emissions, the use of renewable energy sources, air quality, pollution, land and groundwater contamination together with noise and light pollution.

The efficient use of resources during building construction and whilst building is in use should be included to reduce the impact of the proposed development on climate change.

The countryside and the impact of developments on wildlife and their habitats have to be taken into account in planning proposals.

Sustainable development in the built environment can be achieved through good quality design. **6**

(30)

[END OF SECTION B]

[END OF MARKING INSTRUCTIONS]