



Leaving Certificate Examination 2008

Construction Studies

Theory - Higher Level

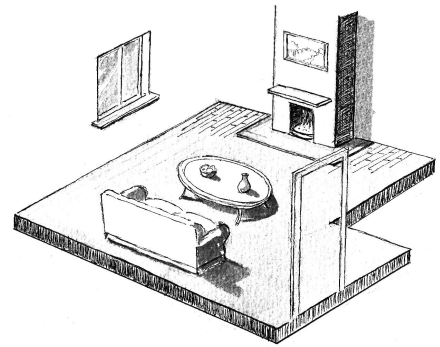
(300 Marks)

Wednesday, 18 June
Afternoon 2:00 to 5:00

- (a) Answer **Question 1** and **four** other questions.*
- (b) All questions carry equal marks.*
- (c) Answers must be written in ink.*
- (d) Drawings and sketches to be made in pencil.*
- (e) Write the number of the question distinctly before each answer.*
- (f) Neat freehand sketches to illustrate written descriptions should be made.*
- (g) The name, sizes, dimensions and other necessary particulars of each material indicated must be noted on the drawings.*

1. An open fireplace is located on the party wall between two semi-detached houses, as shown in the accompanying sketch. The party wall is a 300 mm solid block wall and the ground floor is a concrete floor with a 25 mm woodblock finish.

- (a) To a scale of 1:5, draw a vertical section through the ground floor, hearth and fireplace. The section should show all the construction details from the bottom of the foundation to the top of the second flue liner. Include **four** typical dimensions on your drawing.
- (b) Indicate clearly on the drawing how the flue liners are joined to ensure the safe removal of smoke and gasses from the fireplace.



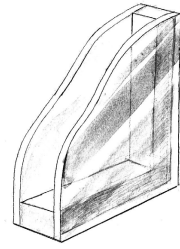
2. (a) Identify **two** possible risks to personal safety associated with **each** of the following:
- (i) fitting a concrete window cill on the second storey of a dwelling house;
 - (ii) laying pipes in a deep trench;
 - (iii) excavating in an area where there are underground electrical cables.
- (b) Using notes and *freehand sketches* as appropriate, outline **two** safety procedures that should be observed to eliminate **each** risk identified at (a) above.
- (c) Discuss in detail **two** reasons why younger workers are more vulnerable to accidents on construction sites and suggest **three** strategies to encourage a safety culture in younger workers.
3. Poor design detailing or workmanship can result in the formation of thermal (cold) bridges, causing significant heat loss through the external fabric of a building.
- (a) Outline **three** areas in a dwelling house where thermal bridges are likely to occur and using notes and *freehand sketches*, show the correct design detailing which will prevent the formation of thermal bridges in each location outlined.
- (b) A house built in the 1980s has 50 mm expanded polystyrene insulation in the cavity of the external wall. Using notes and *freehand sketches*, show **two** methods of upgrading the thermal properties of the external envelope of the house to meet the requirements of the current Building Regulations.
4. (a) Discuss in detail, using notes and *freehand sketches*, **three** functional requirements of a wastewater treatment system suitable for the on-site treatment of sewage from a single house.
- (b) Using notes and *freehand sketches*, show the plan of a typical on-site wastewater treatment system for a single house. Include **three** main dimensions in your sketch.
- (c) Using notes and *freehand sketches*, describe **one** test that is carried out to determine if a site is suitable for an on-site treatment system.

5. It is proposed to replace the single glazing in a dwelling house with double glazing.

(a) Using the following data, calculate the U-value of the:

- (i) single glazing;
- (ii) standard double glazing.

Glass: single glazing	thickness	5 mm
Glass: double glazing	thickness	4 mm
Space between panes	width	12 mm



Thermal data of glazing:

Conductivity of glass	(k)	1.020 W/m °C
Resistance of space between panes	(R)	0.170 m ² °C/W
Resistance of internal surface	(R)	0.122 m ² °C/W
Resistance of external surface	(R)	0.080 m ² °C/W

(b) A choice is to be made between the following types of double glazing:

- standard double glazing;
- low-emissivity (low-e) double glazing.

Using the U-values obtained at (a) above and the following data, calculate the cost of the heat lost annually through **each** of the following:

- single glazing;
- standard double glazing;
- low-e double glazing.

U-value of low-e double glazing:	1.1 W/m ² °C
Area of glazing:	25 m ²
Average internal temperature:	18 °C
Average external temperature:	5 °C
Heating period:	11 hours per day for 40 weeks per annum
Cost of oil:	80 cent per litre
Calorific value of oil:	37350 kJ per litre
1000 Watts:	1kj per second.

(c) Using the information obtained at (b) above, recommend a preferred glazing type and give **two** reasons to support your recommendation.

6. (a) Using notes and **freehand sketches**, discuss the importance of **each** of the following when siting a house sensitively in a rural landscape:

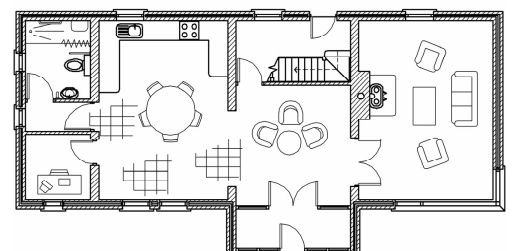
- location of house in the landscape;
- scale of house;
- form of house;
- choice of materials.



(b) The accompanying drawing shows the elevation and ground floor plan of a house designed to have low environmental impact.

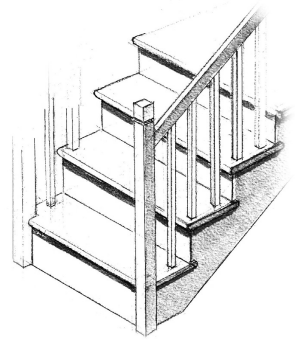
The house has three bedrooms and a bathroom in the attic space.

Using notes and **freehand sketches**, discuss in detail **three** features in the design that contribute to reducing the environmental impact of the house.



7. A cut-string timber stairs suitable for a domestic dwelling is shown in the accompanying sketch.

- (a) To a scale of 1:5, draw a vertical section through the bottom four steps of the stairs. Include the newel post and balustrade and show the typical dimensions of **four** main structural members of the stairs.
- (b) Using notes and *freehand sketches* show **two** design features that ensure that the stairs is safe for all users.



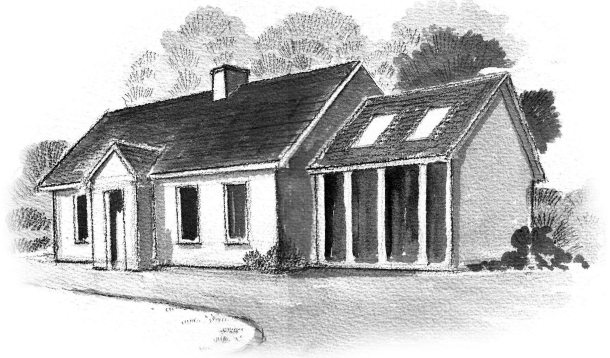
- 8. (a) An oil-fired central heating and hot water system for a two storey dwelling house is designed to provide independent control of hot water and space heating. Using notes and a *single-line diagram*, show a typical layout for such a system. Show **three** radiators on each floor, indicate the necessary control valves and give the typical sizes of the pipework.
 - (b) On a separate diagram show an alternative system for providing domestic hot water which is not dependent on fossil fuels. Discuss **two** advantages of the proposed system.
- 9. (a) Using notes and *freehand sketches*, show the electrical wiring layout for two lights and two switches in a radial circuit of a dwelling house. Indicate on the sketch the typical sizes and colour coding of the electric cables.
 - (b) Using notes and *freehand sketches*, show **two** safety features in the design of the lighting circuit that ensure that it is safe for all users.
 - (c) Using notes and *freehand sketches*, show **two** features that should be incorporated into the design of the lighting system of a dwelling house to ensure the economical use of electricity.

10. The following considerations are important in passive solar design:

- insulation;
- orientation and shade;
- energy efficient glazing and frames.

(a) Using notes and *freehand sketches*, discuss in detail the importance of **each** of the above in the design of a passive solar house.

(b) The accompanying sketch shows a dwelling house with an attached sunspace. Using notes and *freehand sketches*, propose a design layout for the rooms adjoining the sunspace that would maximise the passive solar heat gain from the sunspace.



(c) Give **two** reasons for the proposed room layout adjoining the sunspace.

OR

10. “All we really ask of our houses is that they keep us warm and dry and protect us from intruders. At the moment we achieve this with huge wastage of energy and material. Our simple demands should be obtainable through passive means utilizing only local materials in all but the least hospitable landscapes. Over the last century using fossil fuel reserves has made us lazy in this regard, because in fact, like the houses of animals, our architectural heritage of vernacular buildings were simple, smart and easy to construct”.

Rural: by Dominic Stevens.
mermaid turbulence, cloone, letrim, ireland. (2007)

Discuss in detail the above statement and outline **three** recommendations to the planning authorities that would help create sustainable housing development.

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