

Ionut-Marius Rosu (1910193)

M4X01974 Technology and Environment 1  
Examination paper - May 2020

Attempt all Questions - 20 marks for each question

Note: Equipment required for the examination to include -  
- pen, pencil, ruler and a calculator.

Question 1 Sustainability, Energy and Environment

a) What is your understanding of the term (~~"sustainable"~~  
"sustainability" (5 marks available)

b) Can you complete the sustainability triangle  
below, which illustrate three pillars of sustainability?  
(3 marks available)

|   |                |   |
|---|----------------|---|
|   | 1              |   |
|   | Sustainability |   |
| 2 |                | 3 |

c) Energy and Environment - Name three  
advantages and three disadvantages of solar energy  
technologies? (6 Marks available)

d) Name three advantages and three disadvantages  
of nuclear power? (6 Marks available)

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### Question 2 Wall Construction

- Describe the design performance factors with reference to common methods of constructing external walls in domestic construction in the UK? (8 Marks)
- Describe ways of improving the thermal performance of wall constructions and ~~at~~ identify potential areas of concern for the designer. (6 Marks)
- What are the advantages / disadvantages of using timber in external wall construction? (6 Marks)

### Question 3 Windows

- Draw / Sketch an elevation and sections through the head, jambs and sill of a casement timber window to show it is constructed and assembled within a masonry wall which has a 100 mm brick outer leaf, 100 mm cavity and a 100 mm block inner leaf (10 Marks)

- What is meant by the following terms? Illustrate your answers where applicable with sketches.  
mullion; transom; casement; opening light; metal ~~lit~~ lintel; cavity closer; sill; sub-sill. (10 Marks)

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### Question 4 Stairs

a) Stairs make it possible to pass from one level to another safely. Stairs, ladders and ramps shall offer safety to users moving between levels of the building. Sketch and describe 3 types of stairs and their

Key features. (10 Marks)

b) There are several types of stairs and the simplest is a straight flight consisting of a straight run of parallel steps. A new house due for construction has a ground floor to first floor level overall height of 2600 mm. Provide sketch drawings to describe the key requirements for the stairs to ensure compliance with Part K of the building regulations. (10 Marks)

### Question 5 Roof

Sketch (draw a section drawing through a pitched roof for a domestic dwelling to explain the difference between ~~roof~~ roof structures and describe the merits and component parts of each.

a) A cut roof: (4 Marks)

b) A trussed Rafter Roof; (4 Marks)

c) What are the advantages and disadvantages of using these forms of roof construction? (8 Marks)

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Question 5 (2) Roof

d) What design performance factors/functions  
should be considered in designing a roof?  
(4 Marks)

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Answers

Question 1 Sustainability, Energy and Environment

a) Sustainability (is) means satisfying the needs of today, without compromising the future.

b)

|                      |                          |                      |
|----------------------|--------------------------|----------------------|
|                      | <sup>1</sup> Environment |                      |
|                      | Sustainability           |                      |
| <sup>2</sup> Society |                          | <sup>3</sup> Economy |

c) Adv. Solar energy technologies Disadv.

- Lower carbon footprint than fossil fuel usage  
- Increased sustainability compared to fossil fuelled or nuclear plants  
- provide off-grid power which can translate through a decreased energy cost over time.

- Conditioned by the weather (sun doesn't always shine)  
- Lower energy output than fossil fuelled plants  
- ~~Cannot~~ Solar panels today can only harness 25% of the Sun's power and energy

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Answers

Question 1 Sustainability, Energy and Environment

| d) | Adv.                                                                                                                                                                                                                                                                                                 | Nuclear power | Disadv. |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------|
|    | <ul style="list-style-type: none"><li>- Highest energy output compared to the amount of fuel used.</li><li>- Lower levels of carbon pollution compared to fossil fuel plants</li><li>- Highest safety standards in the industry</li></ul>                                                            |               |         |
|    | <ul style="list-style-type: none"><li>- Any incidents could result in a nuclear catastrophe</li><li>- the radioactive waste (<del>requires</del>) requires special storage conditions.</li><li>- exploitation of the radioactive fuel is dangerous and polluting</li><li>- very expensive.</li></ul> |               |         |

Question 2 Wall Construction

a) Walls have to provide

- shelter
- security
- structural (inter) integrity.
- spacial delimitation

Walls provide shelter from the external factors such as: rain, wind, sun, cold, high temperatures, through insulation and their structural integrity. Some structural integrity can be used as an element of structure for the building, if (they) the walls are load bearing.

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(Answers) Answers

Question 2 Wall (E) Constructions

a) Continuation:

Walls enclose a space. This ~~or~~ enclosed space also give the feeling of security from other people outside.

b) Thermal performance ~~can~~ of wall constructions can be improved by choosing the right ~~(type)~~ type of materials; adding layers of insulation and adapting the design to the external factors such as weather conditions.

Particular attention needs to be paid at the type of insulation used and it's characteristics. For instance, straw or hay based insulation is flammable if left untreated. Rock wool needs to be ~~be~~ kept dry in order to perform. Cuts or gaps in insulation (for service for instance) create areas where cold air can pass into the inside space. Other areas of concern can be ~~have~~ humidity, mold, condensation etc.

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Answers

Question 2 Wall & Construction

c)

| timber in external wall                                                                                                                                                                                                  |                                                                                                                                                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Adv.                                                                                                                                                                                                                     | Disadv.                                                                                                                                                                                                              |
| <ul style="list-style-type: none"><li>- sustainable if the timber is locally sourced</li><li>- easy to install</li><li>- cheaper than other methods of constructing</li><li>- faster to build than brick walls</li></ul> | <ul style="list-style-type: none"><li>- more susceptible to fire</li><li>- limited load-bearing capacity</li><li>- susceptible to wood parasites if not treated</li><li>- not as sturdy as other materials</li></ul> |

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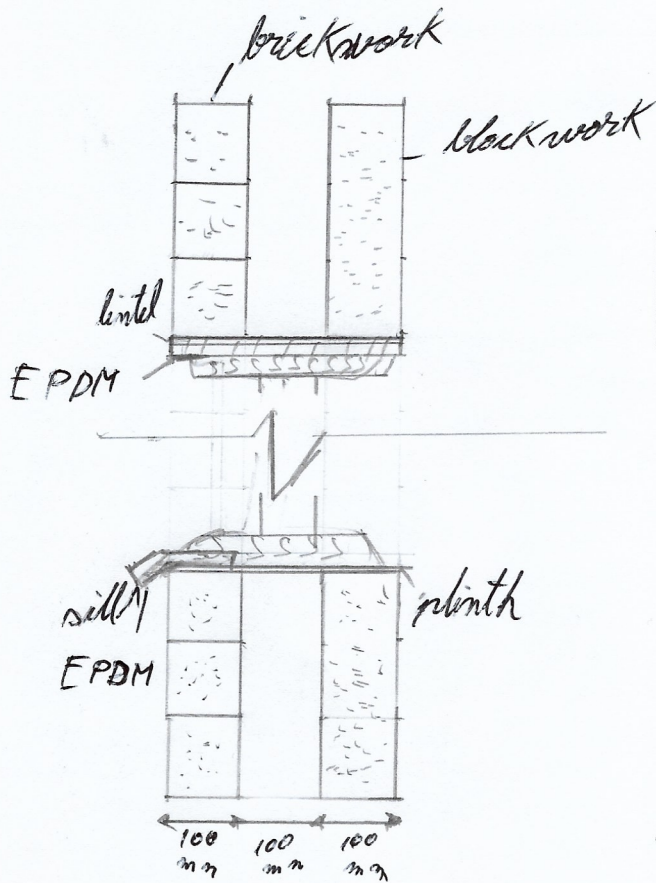
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Answers

Question 3 Windows

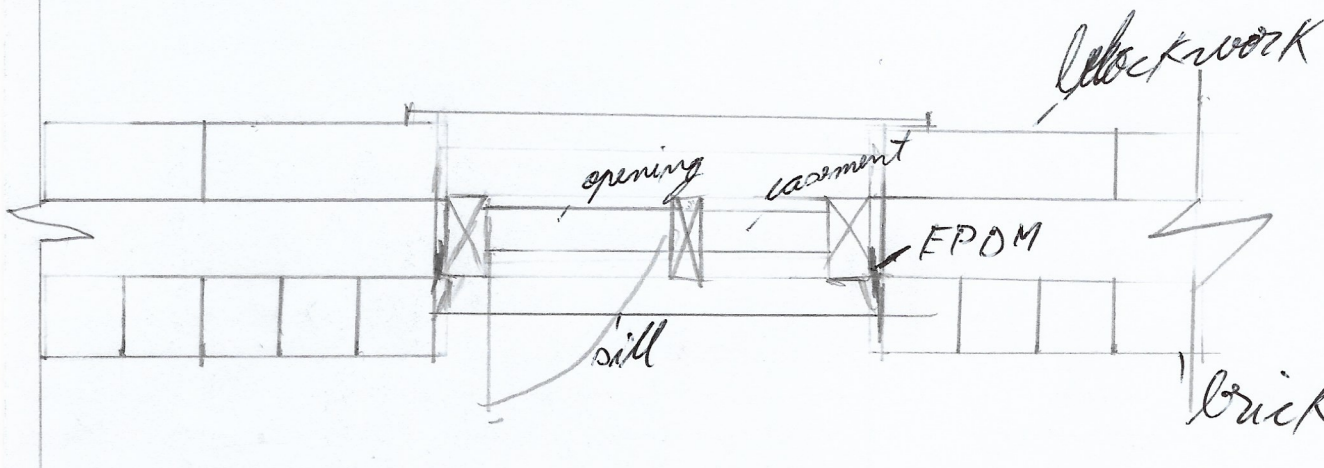
a)



On top - EPDM (membrane) membrane to be placed between lintel and frame

drawing not in scale

On bottom - EPDM (membrane) membrane to be placed between sill and frame. Sill to be fixed to the frame.



EPDM to be stuck between jambs and brickwork

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Answers

### Question 3 Windows

b) (Hull) Mullion (ist) is the vertical part of a window frame

A transom is the horizontal part of a window frame.

A casement is the fixed part of a window frame

The opening light is the part of the frame which opens.

Metal lintel - the part ~~(of a window)~~ (ent) on the top of a window opening which holds the wall above a window, and takes the wall's weight.

A cavity closer is the part of an opening which closes the gap between a ~~(a)~~ cavity wall components (brickwork - cavity - blockwork) and allows for the frame to be fixed on the jambs.

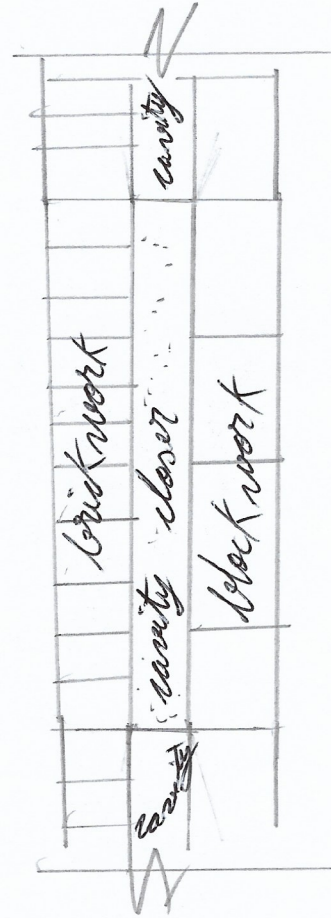
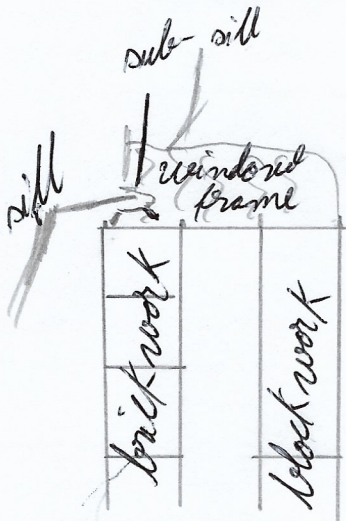
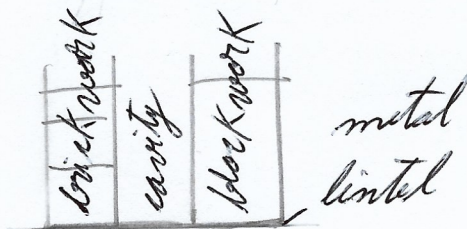
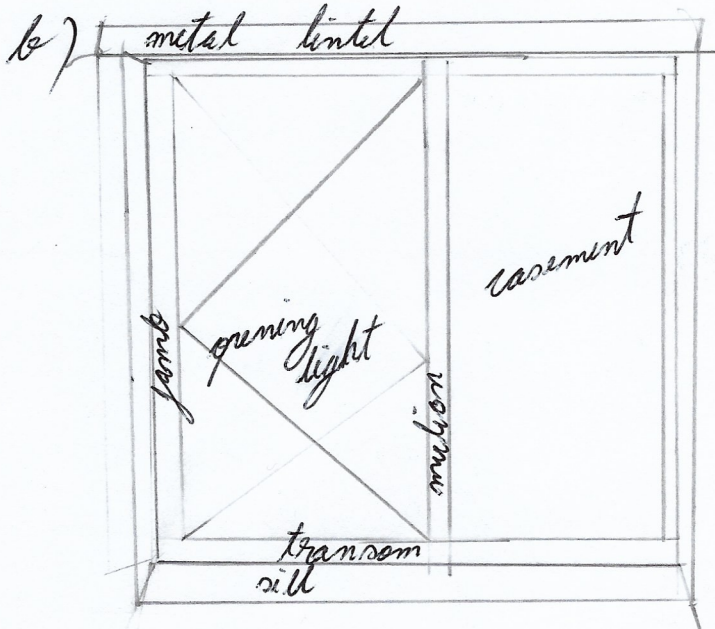
~~(The sill is at the)~~ The sill is at the bottom part of the window frame and it allows for water to go over the wall in which the frame is fixed.

The ~~(sub)~~ sub-sill is a part of the bottom of the window frame and allows for the sill to be fixed into the frame

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Answers

### Question 3 Windows



Drawings not in scale

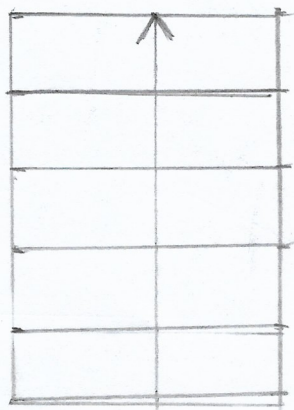
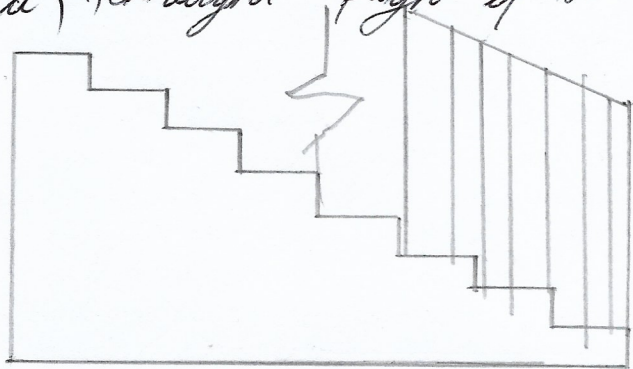
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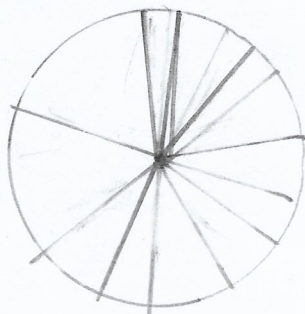
Answers

### Question 4 Stairs

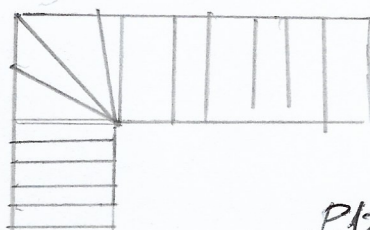
a) 1) Straight flight of stairs



2) Spiral



3) L shaped



- straight run of parallel (stairs) steps
- handrail at height is 100 mm or more

- minimum (clear) headroom is 2 m.

- stairs angle (~~45~~) less than  $45^\circ$  on flight

- gaps of less 100 mm for handrails and riser

- dimensions of rise and step must be consistent

- starts from a centre core and rotates at it's steps at the same (level) angle

- two perpendicular flights united by a platform or a set of curved steps

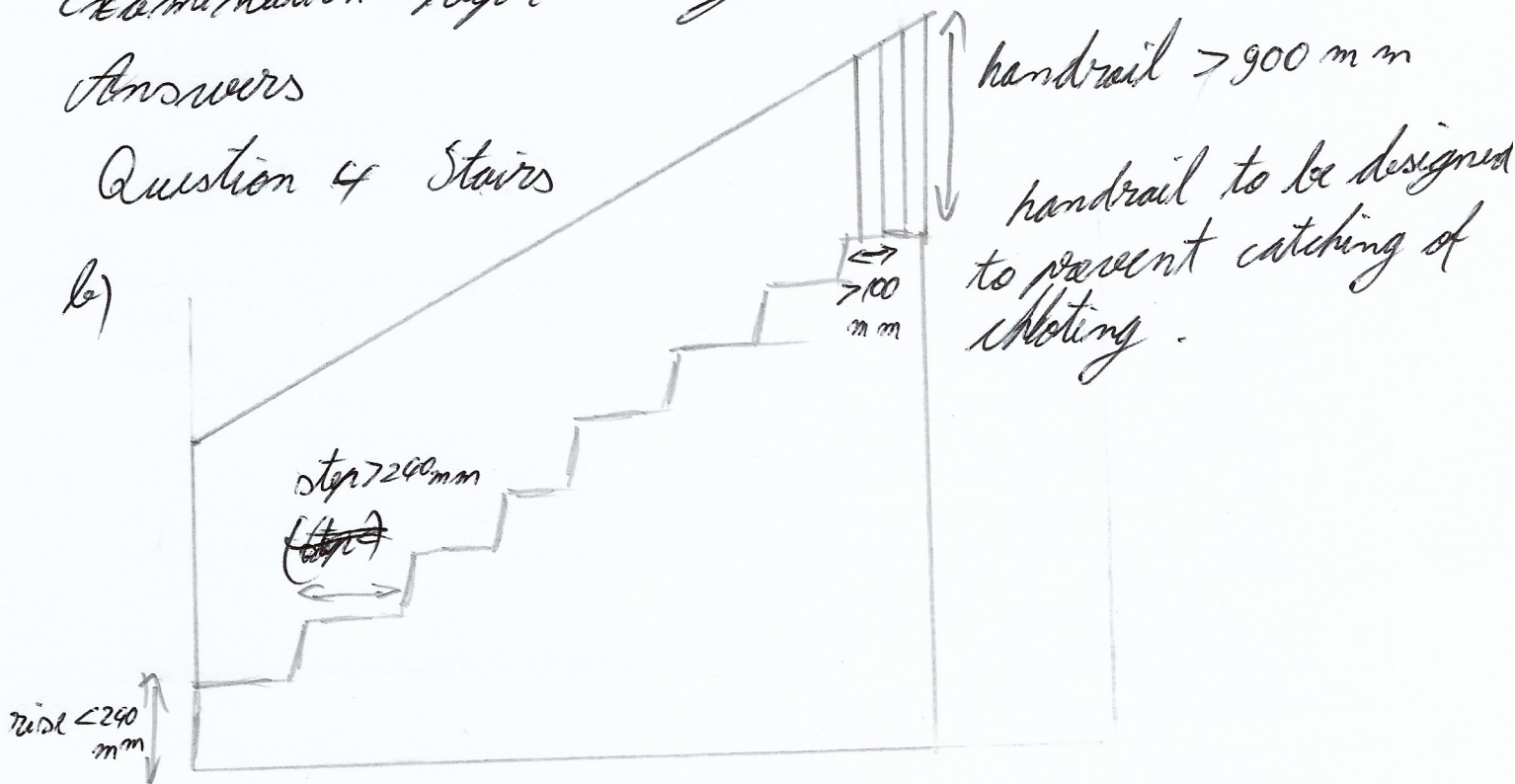
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Answers

Question 4 Stairs

b)

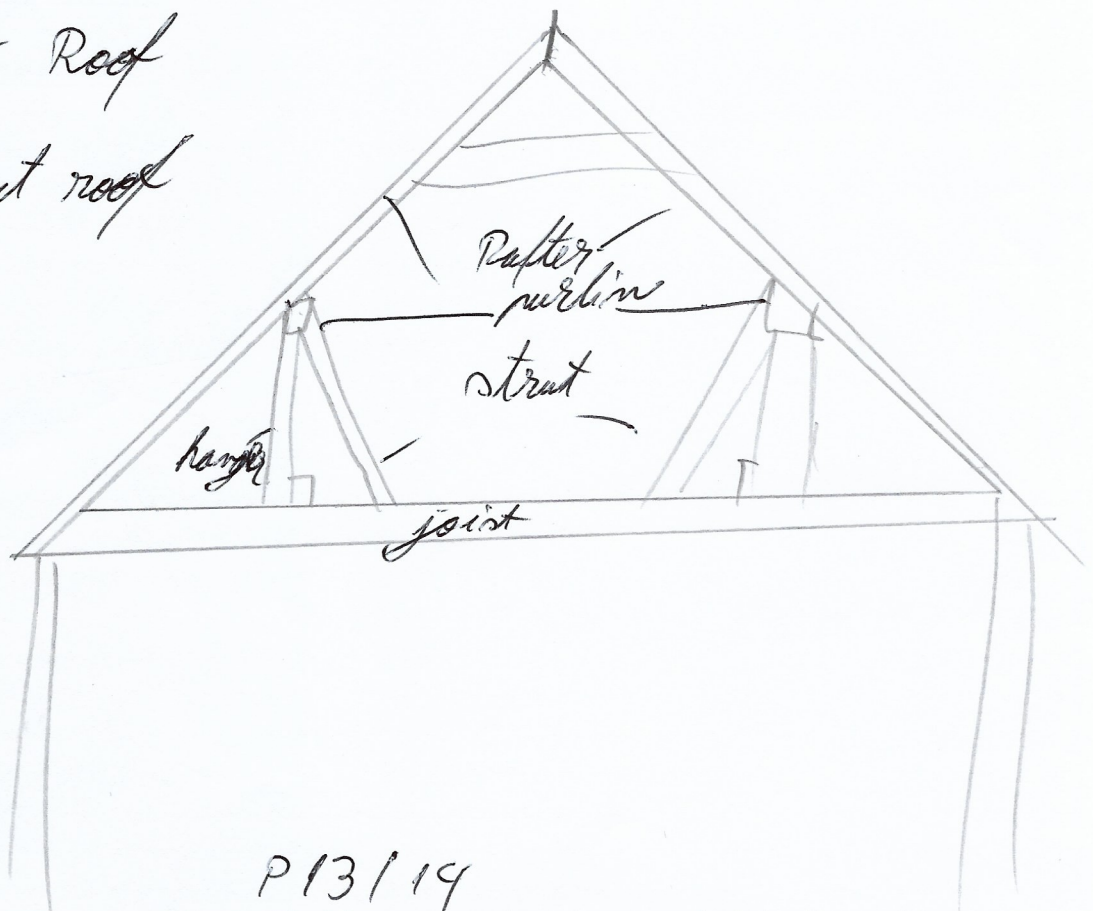


rise  $\neq$  step

flight angle ~~(100)~~  $< 45^\circ$

Question 5 Roof

a) A cut roof



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Answer

Question 5 Roof

d) A roof must support its weight, provide shelter from elements. Must be waterproof and windproof. Most importantly, it must be very well insulated because most of the heat in a domestic dwelling is lost through the roof.

e) As an advantage, a flat roof, does not hold water. also, can be used as a storage area or a room. The downside is that, it ~~can~~ can't be used as a terrace, or a roof garden. Also, their orientation can diminish the capabilities of solar panels.