2010 Building Construction

Higher

Finalised Marking Instructions

SECTION A

Marks

Attempt all the questions in this Section (total 40 marks)

1. *State the main stages of a site investigation and the sequence in which they are carried out.*

Main stages in correct sequence are:

- **Desk study**
- **Site reconnaissance (Walk-over survey)**
- **Ground and soil investigation**

(½ mark each plus ½ mark for correct sequence) **2**

2. (*a*) *Briefly describe **two** types of construction site perimeter fence in common use today.*

1. **Proprietary metal fencing systems – comprising a tubular steel frame and anti climb wire mesh panels fixed at ground level with concrete or plastic foot blocks. Each panel locked together with bolted clamps. (1 mark)**
2. **Timber hoarding – comprising timber posts set into the ground in concrete, timber rails and plywood face. (1 mark)** **2**

(*b*) *State **four** factors which should be considered when deciding where the temporary accommodation on a construction site could be located.*

Locate close to the site entrance
Locate close to existing services
Vehicle parking for site personnel, visitors and materials delivery
Not too far from the construction work
Security of the site and accommodation **(any 4 for 2 marks)** **2**

3. *Briefly describe how the following construction materials should be stored on a site.*

- *Plasterboard dry lining*
- *Gypsum plaster*

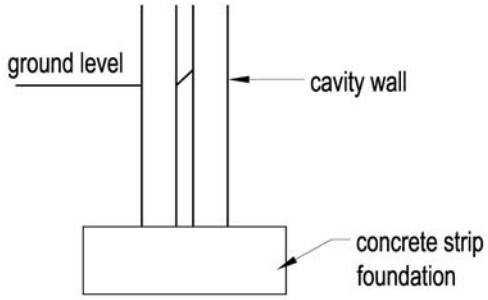
Plasterboard dry lining – Store on pallets supplied in dry conditions. To maintain stability, place pallets on firm level ground, and ensure that stacks are both level and vertical. (2 marks)

Gypsum plaster – Bags should be stored dry inside a building, as absorption of water shortens the setting time and causes set lumps to form in the bags. If storing on a concrete floor, dry timber platforms should be provided. (2 marks) **4**

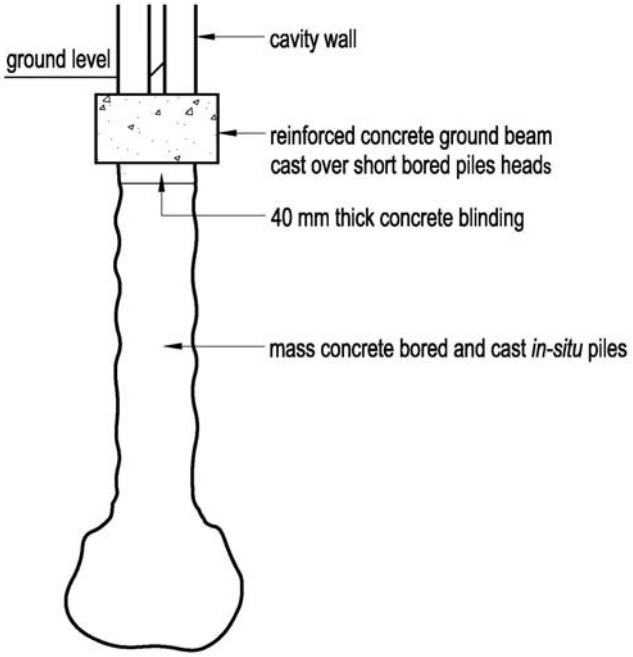
Marks

4. *Prepare an annotated sketch to show a typical vertical cross-section through* ***each*** *of the following foundation types:*

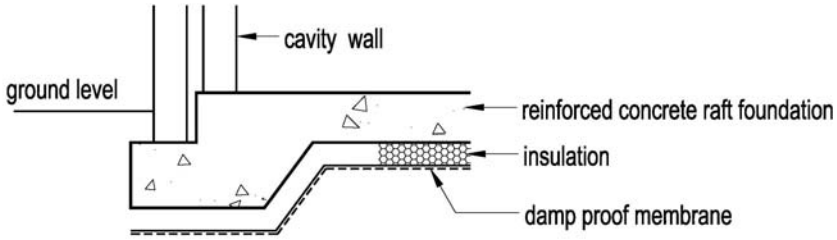
- *traditional strip foundation*
- *short bored pile foundation supporting a ground beam*
- *raft foundation*



Traditional strip foundation (2 marks)



Short bored pile foundation (2 marks)



Raft foundation (2 marks)

(2 marks each) **6**

Marks

5. (*a*) *State the name given to the type of window shown in* ***Figure Q5*** *and name the parts of the window numbered 1 and 2.*

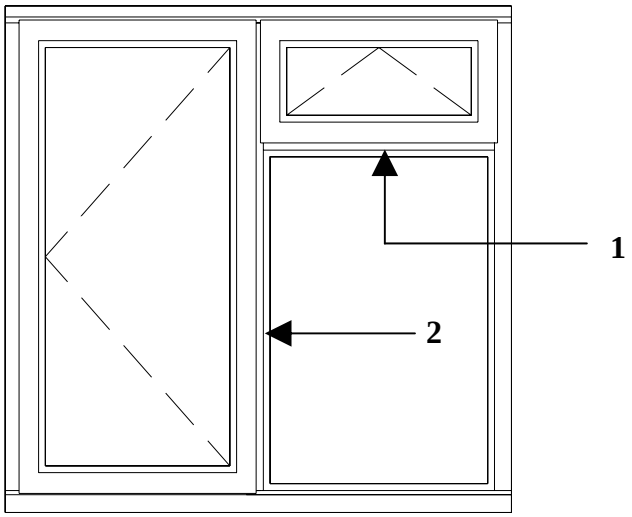
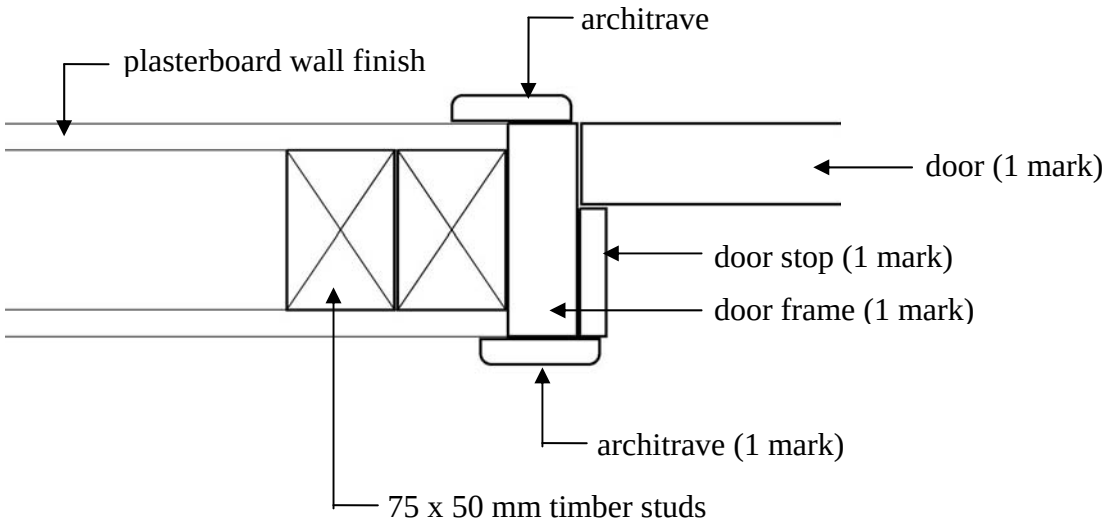


Figure Q5

Casement window (1 mark)
Part 1 – Transom (1 mark)
Part 2 – Mullion (1 mark) **3**

(*b*) *Prepare an annotated sketch to show a cross section through an internal door jamb in a 75 mm x 50 mm timber stud partition with plasterboard both sides finished with taped and filled joints.*



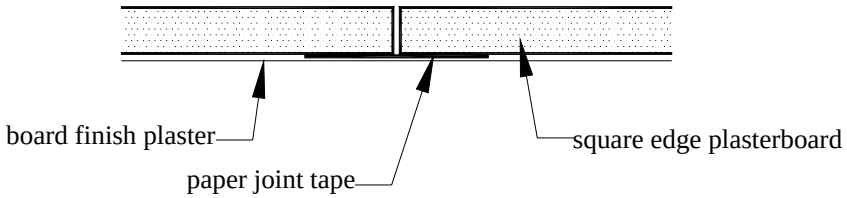
CROSS SECTION THROUGH AN INTERNAL DOOR JAMB

(total 4 marks) **4**

6. *A smooth surface finish is required for the plasterboard walls of a dwelling house ready to receive a wallpaper finish.*

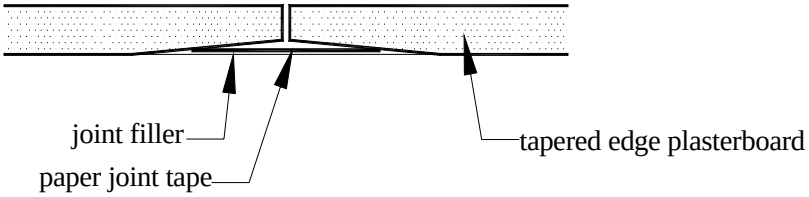
Briefly describe, with the aid of annotated sketches, ***two*** *ways in which this smooth surface finish may be achieved and state which you would select for the proposed wallpaper finish.*

Option 1
Fix square edge plasterboard to the ceiling with the grey face down and apply a paper tape over all joints in the board. Apply a proprietary board finish plaster 2 mm thick. (See sketch below.)



(2 marks)

Option 2
Fix plasterboard having a tapered edge to the ceiling with cream face down. Tape and fill all joints to a smooth surface finish.



(2 marks)

Selection of option for wallpaper finish. Option 1 would be the most suitable of the two. **(1 mark)** **5**

Marks

7. *(a)* ***Figure Q7*** *shows a vertical cross-section through a ground bearing floor slab for a dwelling house.*
State the name of the component parts numbered 1 to 8.

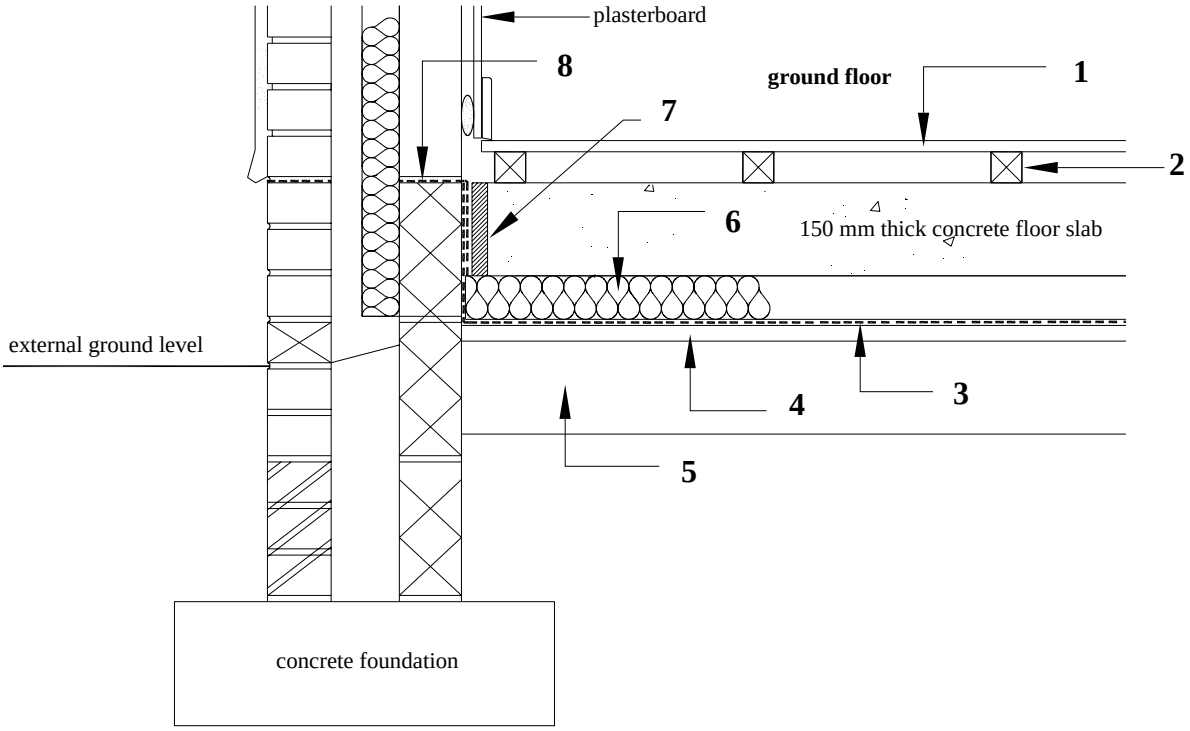


Figure Q7

Component Part No	Name	
1	**Tongued & grooved chipboard flooring (other material acceptable)**	**½**
2	**Timber battens**	**½**
3	**Damp proof membrane (polythene)**	**½**
4	**Blinding (sand)**	**½**
5	**Hardcore**	**½**
6	**Insulation**	**½**
7	**Thermal insulation (25 mm thick)**	**½**
8	**Damp proof course (dpc)**	**½**

(total 4 marks) **4**

(*b*) *Select and describe an alternative solution to finishing the floor above the concrete floor slab.*

A sand/cement screed could be laid on top of the slab followed by a layer of polythene and tongued and grooved chipboard/mdf laid on top as a floor finish.
It would also be possible to lay carpet/vinyl floor finish directly on the screed finish. **(total 2 marks)** **2**

Marks

8. ***Figure Q8*** *shows a cross-section through a stair within a dwelling between a kitchen and dining area.*

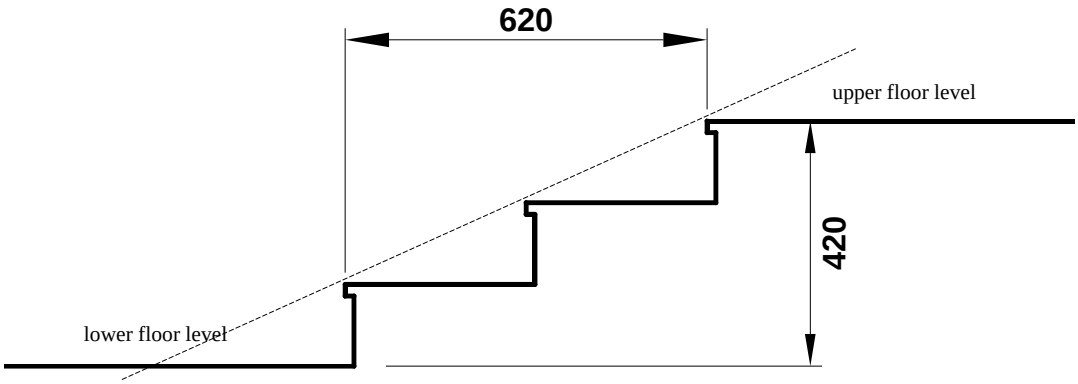


Figure Q8

Using the information given, state whether or not the stair complies with the recommendations made in current standards, giving the reasons for your answer.

Rise	Minimum rise – 100 mm	Rise: 420÷3 = **140 mm** Rise OK	½
	Maximum rise – 220 mm	Rise OK	½
Going	Minimum going – 225 mm	Going: 620÷2 = **310 mm** Going OK	**1**
Number of rises	Minimum 3	Therefore OK.	**1**
	Aggregate of going and twice the rise should be at least 550 mm and not more that 700 mm. (2 x 140) + 310 = **590 mm** therefore OK.		**2**
Pitch	Tan pitch = 140÷310 = 0.45 Inv tan 0.45 = 24.22 degrees. Which is less than 42 degrees. It is **less than 42 degrees** therefore OK. Stair therefore complies with the recommendations given in current standards.		**1**
		(total 6 marks)	**6**

(40)

SECTION B

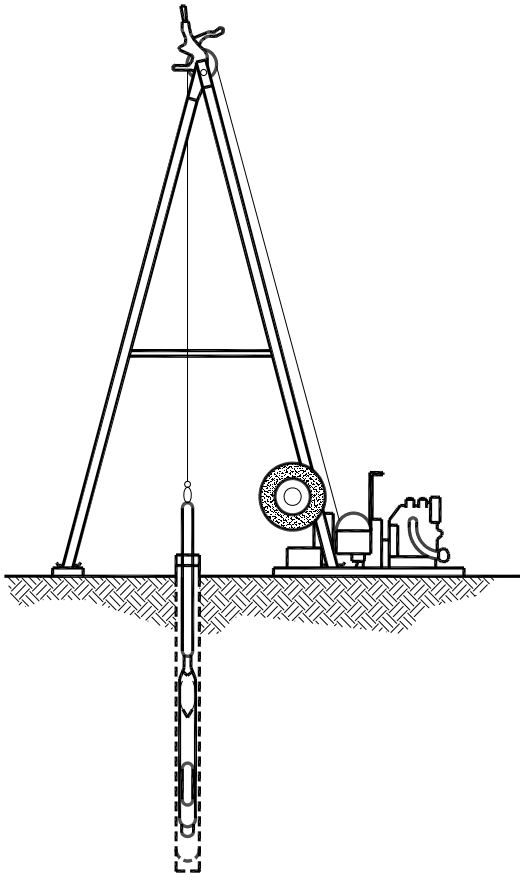
Marks

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

9. (a) *Five new detached houses are to be constructed on a site. Site investigation is to be carried out using light percussion boring (shell and auger).*

(i) *Briefly describe, with the aid of an annotated sketch, this exploration technique.*

The rig is a simple robust, light weight mobile unit operated by two men and towed by a 4x4 vehicle.
A wire rope passes over the pulley at the top of the mast and this rope carries the various drilling tools; the up and down motion of the tools being provided by a diesel power unit.
In light percussion boring the borehole is advanced using the percussive action with a variety of tools.
In order to prevent the borehole caving in and to seal off any ingress of water, a seamless casing is required and this comes in 150, 200 mm diameters and is normally 1500 mm long. The casings are threaded at either end for joining to each other.
Some of the more common tools are:
The shell which is an open length of tube fitted with a clack valve and hardened cutting shoe at other end. (5 marks)



Sketch (1 mark) **6**

(ii) *Briefly explain the advantages and disadvantages of this exploration technique.*

Advantages: It is an extremely versatile method and there are virtually no soils or weak rocks in which it cannot be employed successfully, providing the correct techniques are used. (1 mark)
Depths of up to 60 metres can be achieved in the right soils. Weak rocks or obstructions can be chiselled and rotary attachments for hard rocks can be driven from a power take off. (1 mark)
Disadvantages: May miss an important ground condition or object on a site because the whole site cannot be covered with boreholes. (1 mark)
Slow process averaging a depth of 8 metres in one day. (1 mark)

Other advantages or disadvantages may be acceptable. **4**

(iii) *Briefly describe with the aid of an annotated sketch the field test known as the* ***Standard Penetration Test*** *(SPT).*

This is the most commonly employed *in-situ* test that is carried out during light percussion drilling. It gives an *N* value of the soil which indicates its relative density. The test itself is a dynamic penetration test in which a 50 mm diameter sampling tube with either a solid 60 degree cone or an open cutting shoe at one end is driven into the ground using a standard weight (63.5 kg) freely dropping a standard distance (760 mm). The number of blows needed to drive the sampler a distance of 300 mm is recorded as the *N* value. **6**

(iv) *State a laboratory test carried out on a soil sample.*

Moisture content
Atterberg limit
Particle size distribution
pH test
sulfate test
Undrained shear strength **(any one for 2 marks)** **2**

(*b*) *The foundations for the houses are to be concrete deep strip taken to a depth of 1 metre below ground level.*

(i) *Describe the plant you would select to excavate the foundation trenches.*

Mechanical excavator known as 'Backhoe loader' which has an excavator at the rear and a bucket at the front. **2**

Marks

(ii) *List the materials required to make up a suitable concrete mix for the foundations.*

Any four from the following list:

- **Portland cement**
- **Fine aggregate (sand)**
- **Course aggregate (stone)**
- **Water**
- **Admixture** **(4 x ½mark each)** **2**

(iii) *Briefly explain how a contractor may obtain a supply of concrete for the foundations and state **one** reason why he may do so.*

Contractor may obtain a supply of concrete from a local ready mixed concrete supply depot (batching plant). One reason he may do so is to maintain a consistent supply of quality concrete. **3**

(iv) *State **two** ways in which a concrete mix may be specified.*

Designed concretes
Prescribed concretes
Standardised prescribed concretes
Designated concretes
Proprietary concretes **(any two from five – 2 marks)** **2**

(v) *Compaction is an important process in achieving the design strength of finished concrete.*

Briefly describe how successful compaction may be achieved in the foundation concrete.

Compaction of the concrete is important to remove air from the concrete and may be undertaken by using either a poker vibrator or a beam vibrator. The poker vibrator (one of the most common) is inserted into the concrete during pouring/placing operations.
The beam vibrator is designed for concrete slabs. If air is not removed, finished concrete surface may be honeycombed. **3**

(30)

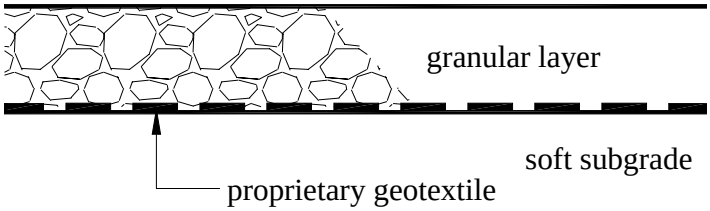
Marks

10. (*a*) *Select and describe **one** common method of forming a temporary road into a construction site where the ground conditions are known to be soft.*

Select one from:

Lay proprietary geotextile membrane followed by Type 1 or 2 hardcore from a quarry and compact it in layers to provide a suitable temporary road. (See sketch below.) OR

Contractor may decide to partly construct the permanent roads on the site but without any kerbs or surface finish. **4**



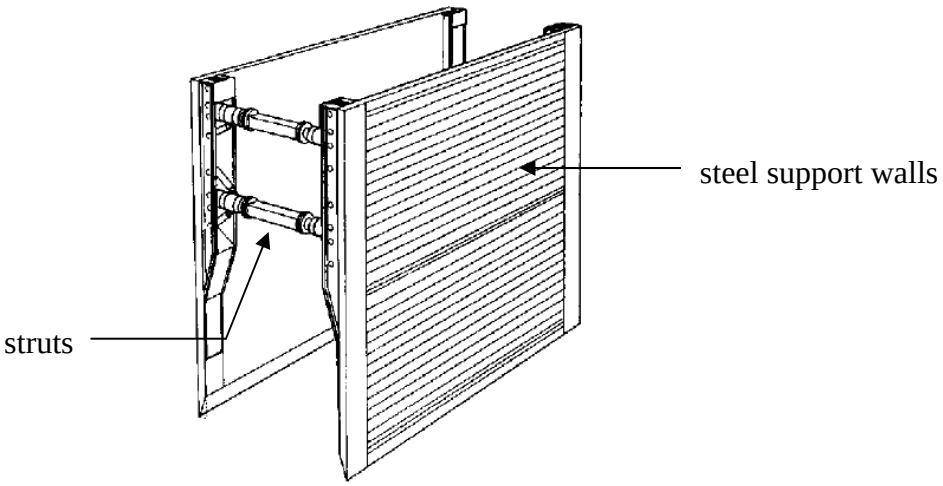
(*b*) *A new sewer passing below a roadway will require excavation to a depth in excess of 2 metres at some points along its length.*

(i) *Briefly explain why it would be important to carry out a safety "risk assessment" prior to commencing a trench excavation and describe the factors which would be taken into consideration.*

Many accidents have occurred as a result of sudden collapse of the sides of a trench excavation where people are working at the base of the excavation. The risk of collapse must be assessed by taking account of the soil types, weather, depth of excavation and means of support etc. **3**

(ii) *Briefly describe, with the aid of an annotated sketch,* ***one*** *method of supporting the trench during the excavation and placing of the new sewer.*

Candidates may choose either: Proprietary shoring systems lifted into place by mechanical plant or traditional timbering of the trench. The sketch below indicates a proprietary box system which is modular and has strutted support. It acts as a safety box to protect workmen. Boxes of this type can be extended in width and height. **3**



(*c*) ***Worksheet Q10(c)*** *shows an incomplete detail drawing for a foundation and a suspended timber ground floor to a dwelling house.*

On the ***worksheet,*** *complete the drawing to an approximate scale to show the following:*

- *support for the suspended floor;*
- *how moisture is prevented from entering the building;*
- *solum treatment;*
- *insulation;*
- *ventilation;*
- *floor finish;*
- *two critical dimensions.*

Refer to worksheet **10**

Marks

(*d*) *Briefly describe, with the aid of annotated sketches, how the following finishes would be applied to the structure:*

- *external render with a dry dash finish;*
- *ceramic wall tiles to bathroom.*

Details of the background materials should be included together with any preparation which may be required.

External render with a dry dash finish
The sequence should include most of the following points:

- **Preparation of the background by brushing down with a hard broom to remove dust and loose particles.**
- **Immediately before applying the undercoat check background for excessive suction. Dampen but do not soak backgrounds as appropriate.**
- **Apply the undercoat mix by laying on with a trowel to a thickness of between 8 mm and 10 mm. Trowel with pressure to remove air. Key the undercoat with a comb to scratch the surface. Cure the undercoat before applying top coat.**
- **Apply butter coat of rendering to a uniform thickness of 8 mm and while it is still plastic throw washed aggregate onto the surface to a uniform dense coverage. Immediately tamp the aggregate lightly into the butte coat to ensure a good bond is obtained.** **5**

Ceramic wall tiles to bathroom
The sequence should include most of the following points:

- **Establish a vertical centre line on which either a tile centre or joint will reside.**
- **Establish a level line with timber straight edge to position starting course and ensure rows of tiles are truly horizontal.**
- **Apply adhesive to the wall 3 mm thick and comb through with a notched trowel.**
- **Press dry tiles into the adhesive with a twisting and sliding action.**
- **Grout tiles with a waterproof grout.** **5**

(30)

[Turn over

11. (*a*) ***Worksheet Q11(a)*** *shows an incomplete detail drawing of an external door jamb.*

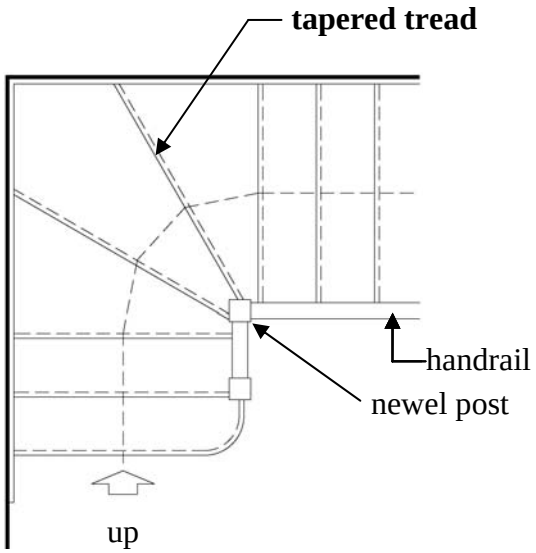
On the ***worksheet****, complete the drawing in proportion with notes to show the following:*

- *timber door;*
- *timber door frame;*
- *fixings;*
- *internal finishes;*
- *facings;*
- *sealant.*

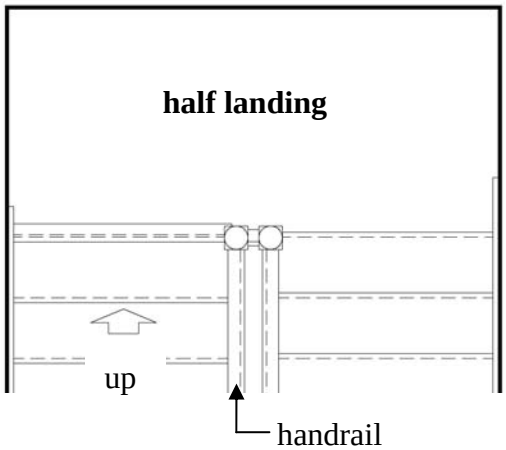
Ensure compliance with current standards and traditional Scottish practice.

See worksheet Q11(*a*) **6**

(*b*) *Prepare annotated sketches to illustrate the following terms relating to a stair:*
(i) tapered tread;
(ii) half landing.



(i) TAPERED TREAD (1 mark)



(ii) HALF LANDING (1 mark)

2

Marks

(*c*) ***Worksheet Q11(c)*** *shows details of a new timber private stair which rises to an attic conversion comprising two bedrooms and a bathroom.*

(i) *On* ***worksheet Q11(c)****, state the names of the component parts of the stair lettered A to F.*

Refer to worksheet (6 x 1 mark each) 6

(ii) *State on the* ***worksheet*** *the* ***minimum*** *permitted dimension for* ***each*** *of the following:*

- *going at points* ***X;***
- *headroom at point* ***Y;***
- *height of the handrail;*
- *effective width of the stair.*

Refer to worksheet (4 x 1 mark each) 4

(iii) Using the dimensions given on the ***worksheet****, calculate the rise, and select a suitable going and pitch of the stair to comply with the recommendations made in current standards. On the* ***worksheet*** *at point* ***Z*** *mark the overall going of your stair.*

There are 13 risers and the overall rise is 2665 mm
Therefore each rise is 2665÷13 = 205 mm (1 mark)
The maximum pitch permitted is 42 degrees. (1 mark)
Establish going:
Tan 42 = opp÷adj
Therefore adj = opp ÷ tan42
Adj = 205 ÷ 0.9
Adj = 227.77 mm round up to 230 mm.
Therefore going is 230 mm minimum. (3 marks)
Overall going 'Z' = 12 x 230 mm.
Overall going 'Z' is 2760 mm. (1 mark) 6

Marks

(*d*) *Briefly describe, with the aid of an annotated sketch, how **one** of the following roof finishes is applied and fixed to the structure of the building:*

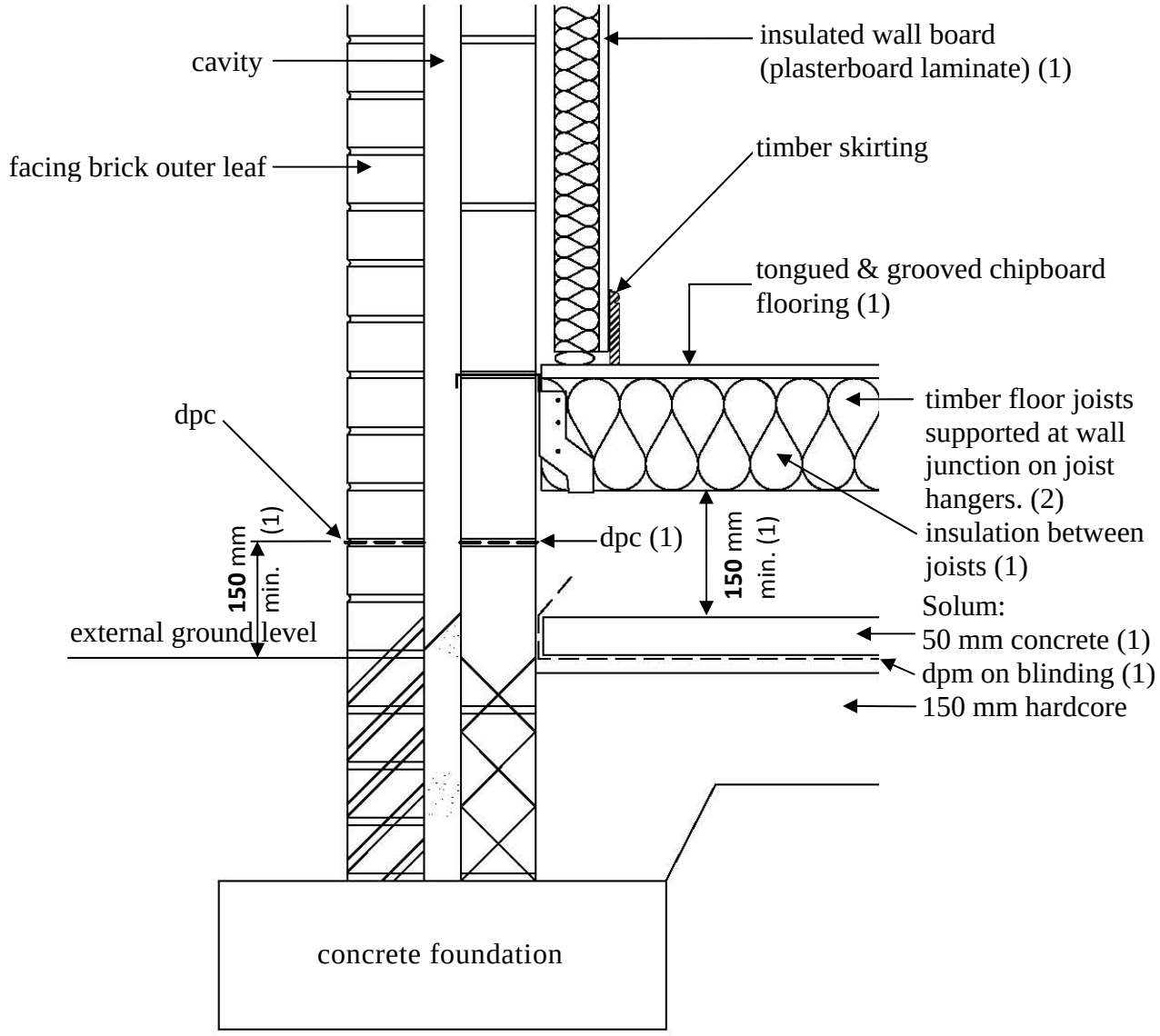
- *single lap concrete roof tiles*
- *PVC single ply membrane*

Single lap concrete tiles are fixed over timber battens which run horizontally along a roof. There may or may not be counter battens. It is important that tiles are laid in accordance with manufacturer's instructions. Exposure to wind results in tiles being mechanically fixed with clips. Fixing is generally at verges, eaves and approximately every second course of tiles. **6**

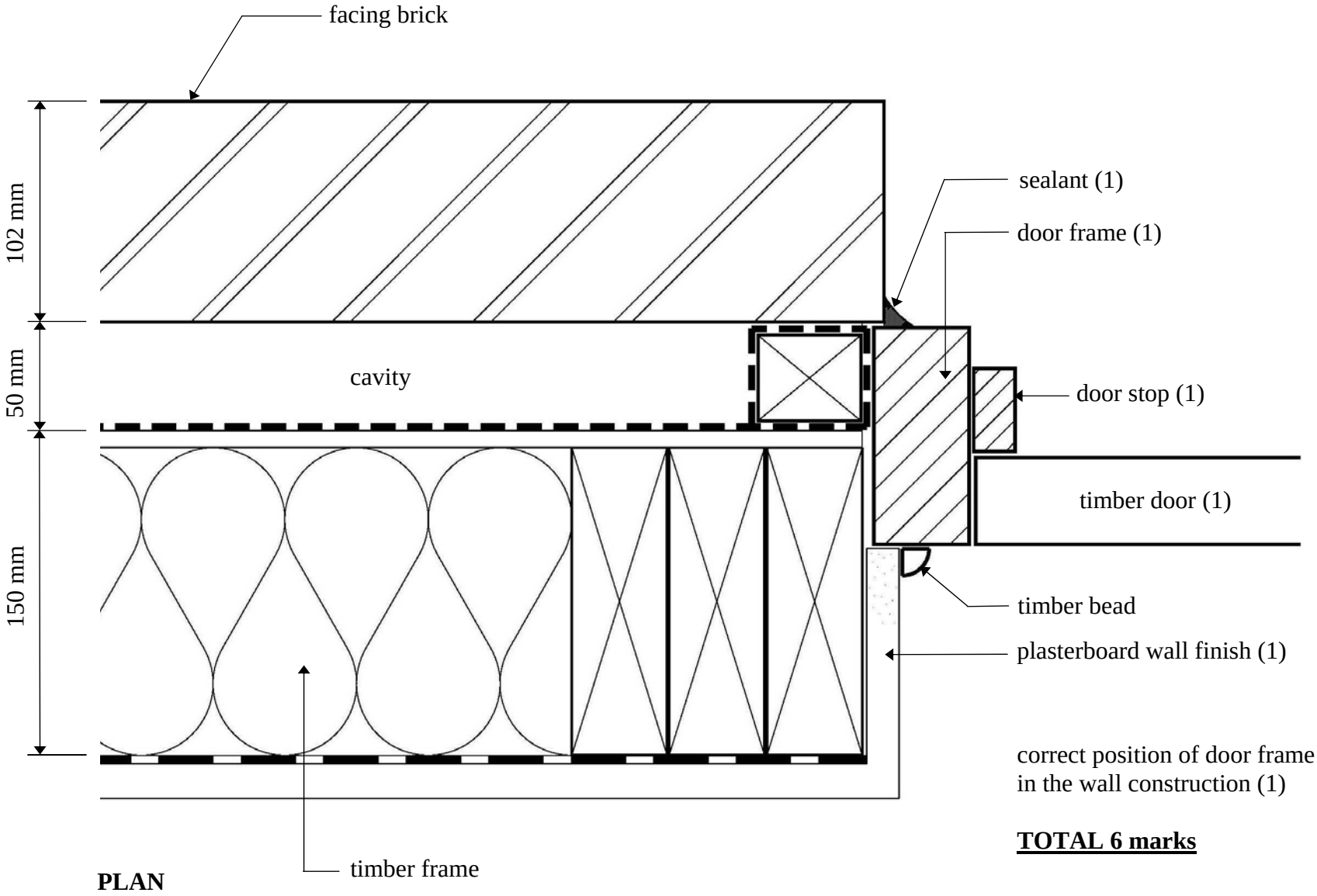
PVC single ply membranes are supplied in rolls and laid as a single membrane. Fixing can be full adhered, mechanically fixed or laid loose with ballast on top. Joints in the PVC membrane are heat sealed on site and are very strong. The PVC membrane is the water proof membrane and can be below the insulation (inverted) or laid on top of insulation (warm). **6**

(30)

WORKSHEET Q10(*c*)



VERTICAL SECTION THROUGH FOUNDATION



WORKSHEET Q11(*a*)

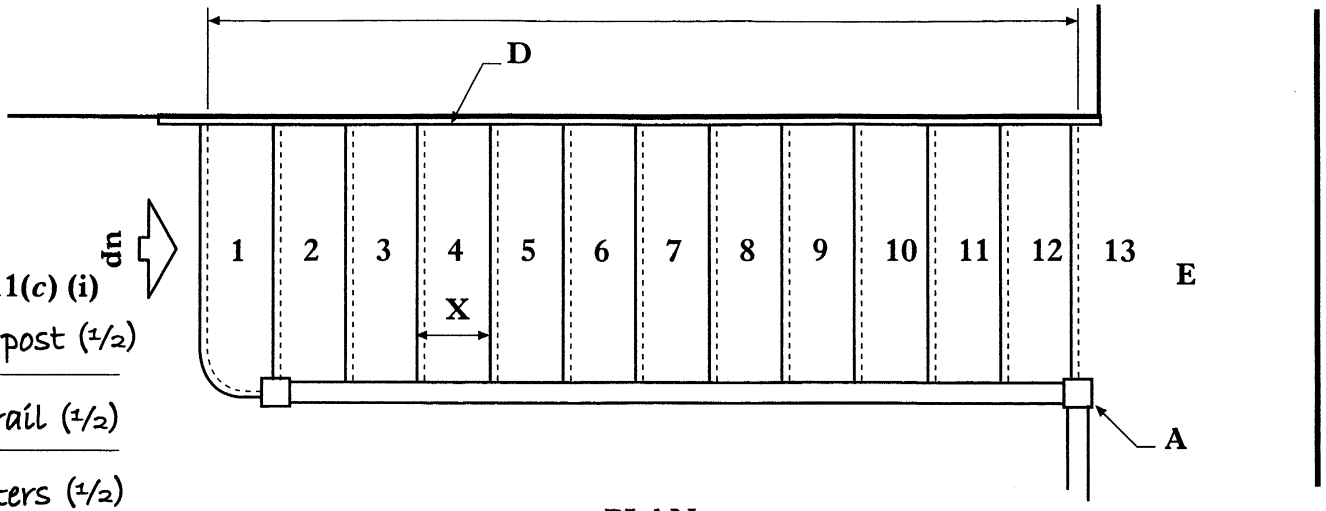
correct position of door frame in the wall construction (1)

TOTAL 6 marks

WORKSHEET Q11(*c*)

Question 11(*c*) (iii)

Z 2760 mm



PLAN

Question 11(*c*) (i)

A Newel post (1/2)

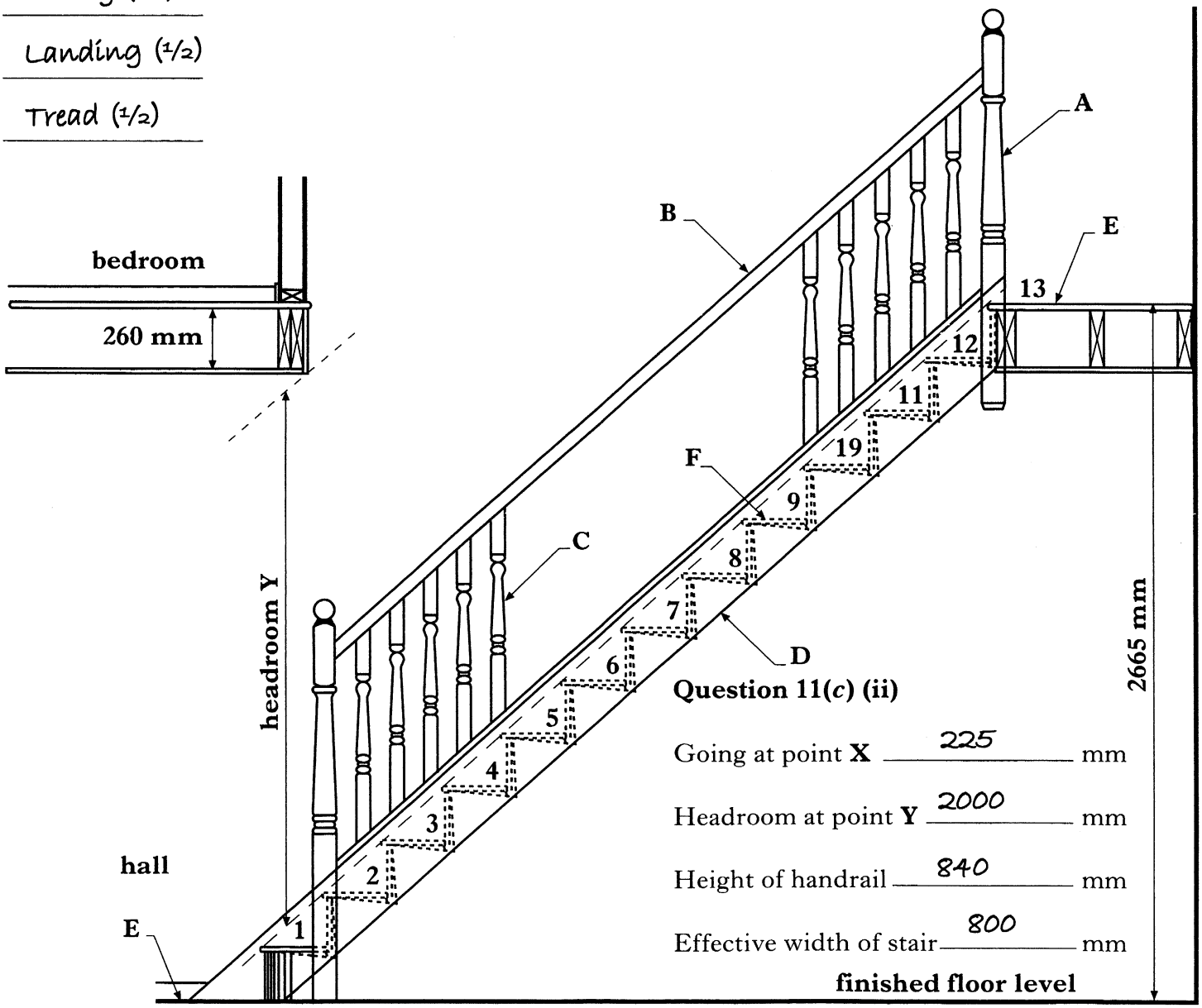
B Handrail (1/2)

C Balusters (1/2)

D String (1/2)

E Landing (1/2)

F Tread (1/2)



Question 11(*c*) (ii)

Going at point **X** 225 mm

Headroom at point **Y** 2000 mm

Height of handrail 840 mm

Effective width of stair 800 mm

ELEVATION

[*END OF MARKING INSTRUCTIONS*]