



# MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION

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(ISO/IEC-27001-2005 Certified)

**Subject code 12036**      **SUMMER- 13 EXAMINATION**  
**Model Answer: Building Construction**

Important instruction to examiners:

- 1) The answers should be examined by key words and not as word to word as given in the model answer scheme.
- 2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
- 3) The language errors such as grammatical, spelling errors should not be given more importance (Not applicable for subject English and Communication Skills).
- 4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by the candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
- 5) Credits may be given stepwise for numerical problems. In some cases the assumed constant values may be vary and there may be some difference in the candidates answer and model answer.
- 6) In case of some questions credit may be given by judgment on part of examiner of relevant answer based on candidates understanding.
- 7) For programming language papers, credit may be given to any other program based on equivalent concept .



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Model Answer: Building Construction

Q.1	Attempt any ten of the following	20
a)	1) Substructure: - A part of the structure lying below the ground surface such as foundation of any type is known as substructures.	01
	2) Superstructure: -Superstructure denotes part of the structure lying above the ground surface.	01
b)	1) Granite 2) Pegmatite 3) Syenite 4) Diorite 5) Gabbro 6) Diabase	0.5x 4=02
c)	1) Open Foundation 2) Steeped foundation 3) Raft foundation 4) Pile foundation 5) Shallow foundation 6) Deep foundation	0.5x 4=02
d)	1) Crow –bar 2) kassi or phawrah 3) Iron pan 4) Sledge Hammer 5) spade 6) Pick-axe 7) Rammer 8) Line and pins 9) Wedge 10) Boring rod 11) Excavator	0.5x 4=02
e)	1) Arrangements for placing site office, store room, labour quarter, medical aid center, godowns 2) Proper co-relation and co-ordination among different units 3) The areas should be properly allotted, so as to save the time.	1 X 2 = 02
f)	Because well bonded walls help in distributing the load of structure over a larger of wall.	02
g)	1) Panelled door 2) Battened door 3) Flush door 4) Collapsible door 5) Rolling shutters 6) Glazed door	0.5x 4=02
h)	1) Staircases 2) Elevators/ Lifts 3) Ramps 4) Moving stairs / escalators 5) Fire escapes	0.5x 4=02
i)	1) Internal door: - 0.9mX 2.00m to 1.00m X 2.00m External door: - 1.00m X 2.00m to 1.1m X 2.00m 2) Bath & W/C: - 0.7mX 2.00m to 0.8 m X 2.00m	01



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Q.2)	j) Pointing: - Pointing is art of finishing the mortar joints in the exposed masonry with suitable cement or lime mortar, to protect the joints from weather effects and also to improve the appearance of building structure.	01																					
	k) 1) Cement 2) Mud 3) Lime 4) 5) Plaster of Paris ( gypsum) 6) Barim 7) Asbestos marble	02																					
	l) 1) Uneven bearing capacity of soil at foundation level. 2) Different loads on different parts of foundation 3) Varying ground water- table height 4) Compressible foundation soil 5) Pockets of different type of soil under the foundation level	0.5x 4=02																					
	6) Expansive soils such as black- cotton -soil	1 X 2 = 02																					
	<b>Attempt any four of the following.</b>																						
	a)	16																					
	<table><tr><td>Aspect</td><td>Load bearing</td><td>Frame structure</td></tr><tr><td>Soil condition</td><td>Hard strata available at shallow depth</td><td>Suitable in any type of strata at any depth</td></tr><tr><td>Floor space</td><td>Less floor area available due to thick walls</td><td>More floor area due to thinner walls</td></tr><tr><td>Height</td><td>Allowed up to 4 storeys</td><td>Multistoreyed construction possible</td></tr><tr><td>Time of construction</td><td>Slow and time consuming construction</td><td>Fast and speedy construction</td></tr><tr><td>Economy</td><td>Economical up to 2 storeys</td><td>Economical for multistoreyed buildings</td></tr><tr><td>Wall</td><td>Walls act as a structural member as well as partitions</td><td>Walls do not carry loads but act only as partitions.</td></tr></table>	Aspect	Load bearing	Frame structure	Soil condition	Hard strata available at shallow depth	Suitable in any type of strata at any depth	Floor space	Less floor area available due to thick walls	More floor area due to thinner walls	Height	Allowed up to 4 storeys	Multistoreyed construction possible	Time of construction	Slow and time consuming construction	Fast and speedy construction	Economy	Economical up to 2 storeys	Economical for multistoreyed buildings	Wall	Walls act as a structural member as well as partitions	Walls do not carry loads but act only as partitions.	1x4= 04
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b) 1) The structure of the stone should be compact granular structure.																							
2) It should have high crushing strength more than 100 N/mm <sup>2</sup> .		0.5x																					
3) It should have high durability and sufficient co-efficient of hardness more than 14.		8=04																					
4) It should have eqigranular texture.																							
5) It should have specific gravity ranges from 2.8 to 2.4.																							



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- 6) It should be highly resistance to wear and fire .
  - 7) It should have low water absorption.
  - 8) It should have better resistance to abrasion.
  - 9) It should have high impact value.
  - 10) It should be easily carved and dressed.
  - 11) The good stone should be highly resistant to weathering.
  - 12) It should be durable.
  - 13) It should have better appearance and colour.
  - 14) It should be polished properly.
- c)**
- 1) The brick should be well burnt, copper colored or reddish in colour, free from Cracks and with sharp edges.
  - 2) Its colour should be uniform and bright throughout.
  - 3) The brick should be uniform in shape and which standard size.
  - 4) The burnt clay bricks should be free from voids.
  - 5) When two bricks are struck with each other, then it should give a clear metallic ringing sound.
  - 6) When the burnt clay bricks are soaked in water, it should not absorb water more than 20% of its dry weight.
  - 7) When the burnt clay bricks are dropped flat on hard ground from a height of about 1 meter, it should not crushed into pieces.
  - 8) The burnt clay bricks should be hard. When it is scratched with finger nail, no impression should be left on brick surfaces.
  - 9) Burnt clay brick should have crushing strength or compressive strength more than 5.5 N/mm<sup>2</sup>
  - 10) Sound proof and should have low thermal conductivity.
  - 11) When the bricks are soaked for 24 Hrs. ,no white salts deposits should be seen after drying.

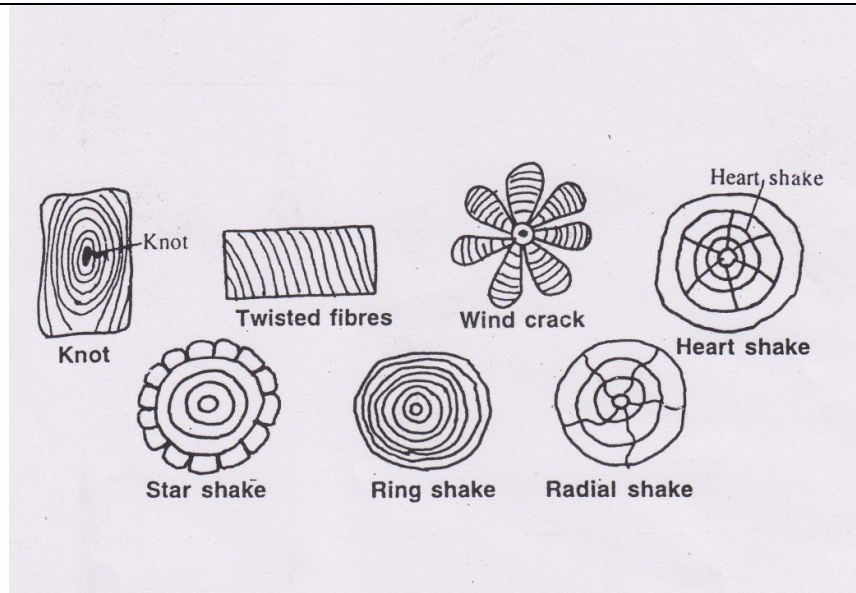
**d)**

0.5x  
8=04



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1x4 =  
04

**e) Mortar :** When the binding materials such as cement or lime is mixed with inert materials like sand, cinder or surkhi and water in appropriate proportion, then a paste is formed which is called as mortar.

01

**Uses :** 1) It is used as a binding material in stone and brick masonry work.

2) It is used to carry out pointing and plaster work on the exposed surfaces of masonry.

0.5x  
6=03

3) Its gives uniform and smooth coat on the exposed surfaces of brick wall.

4) It is used to form an even and soft bedding layer for various building units.

5) It is used to improve the general appearance of structure

6) It is used to prepare moulds for coping, corbels, cornice etc.

7) It helps in binding the open joints of brick work and stone work

8) It is used to fill in cracks in the maintenance work.

**f) Job layout:** 1) Arrangements for placing site office, store room, labour quarter, medicalaid center, godowns .

02

2) Proper co-relation and co-ordination among different units.

3) The areas should be properly allotted, so as to save the time.

4) Job layout depends upon a) Location, area and topography of the site. b) Method



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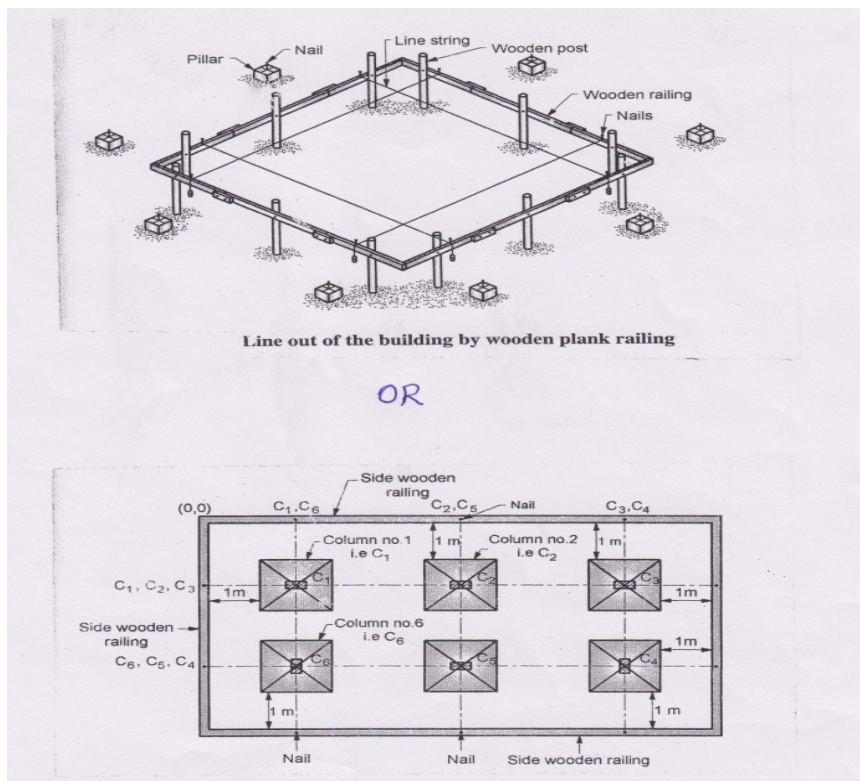
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Q.3)	<p>of construction c) Nature and type of work.</p> <p><u>Site Clearance:</u> 1) It is very important factor to be considered before commencement of project work.</p> <p>2) There should be not any obstruction like trees, plants, shrubs, bigger size stones etc.</p> <p>3) Approach road should be wide</p> <p>4) If site ground is uneven, then it should be made plane.</p> <p>5) Study the final levels of approach road.</p> <p>6) Starting the line out, site cleaning and fair leveling of plot should be completed.</p>	02
	<p><b>Attempt any four of the following.</b></p> <p>a) Centre Line Method for Framed Structure :</p> <p>1) In the first stage, the corners of the building to be constructed are marked first with respect to permanent object and the length of sides of the plot is checked by diagonal measurement. It is called as diagonal check so as to achieve better accuracy.</p> <p>2) Centre of each column with respect to wooden plank railing as shown in fig. are marked by lime powder thoroughly mixed with sand.</p> <p>3) The marking of the size of the foundation pits to be excavated for the column is done by line powder.</p>	16 02



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Fig.



02

01

0.5x  
6=03

**b) Earthwork :**Earthwork consist of either excavation in the ground , or filling up trenches or raising the level by putting excavated soil in place.

- 1) Crow –bar 2) kassi or phawrah 3) Iron pan 4) Sledge Hammer 5) spade  
6) Pick-axe 7) Rammer 8) Line and pins 9) Wedge 10) Boring rod 11) Excavator

02

**c)Foundation :** Foundation is the lowest part of a structure below the ground level which provides a base for the building. Or foundation is a part of structure which receives load of the building and transfers it safely to the lower soil strata without any excessive settlement

**Purposes :** 1) To distribute the weight of the structure over larger area so as to avoid over loading of the soil beneath.

2) Due to loading of sub-soil the structure may settle. The work of the foundation is to prevent unequal settlement.

3) The foundation provides a level surface for building operations.

4) The foundation takes the structure deep in to the ground, thus increasing the

0.5x  
4=02



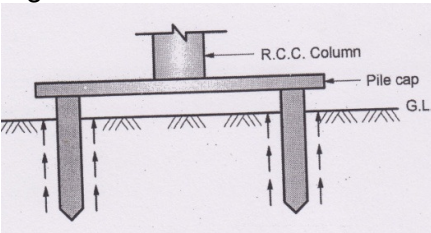
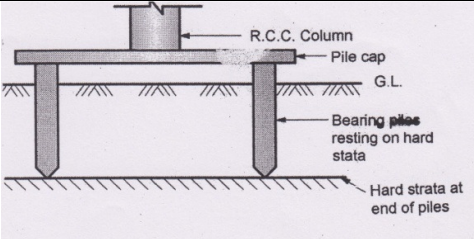


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stability of building.

d)

Friction piles	Bearing piles	
1) When piles transfer the loads only by means of skin resistance without any end bearing	When the piles the transfer the load through a soft soil strata to a suitable bearing stratum at greater depth	02
2) No hard strata at the ends of piles	Hard strata at the ends of piles	01
3) Fig. 		01

01

e) 1) Through stone : In stone masonry work, some stones in one piece or in two pieces ( two pieces overlap each other, ) at regular interval are placed right across the walls

01

2) Corner stone : The extension angle or corner of wall is turned as quoin and the edge shaped stone used for corner of all. Known as corner stone.

01

3) Facing : The exterior of a wall exposed to weather is known as face. The material Used in the face of the wall is known as facing.

01

4) Hearting : It is the interior portion of a wall between the facing and backing.

f)Types of stone masonry:

1) Rubble masonry

02

a) Dry rubble masonry b) U.C.R. masonry or Random rubble masonry

( Uncoursed) c) coursed rubble masonry d) Squared rubble masonry ( Uncoursed)

e)Squared rubble masonry ( coursed)





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	<p>Use : Retaining walls , compound wall, plinth wall, boundary walls etc.</p> <p>2)Ashlar masonry :</p> <p>a) Ashlar fine b) Ashlar chamfered c) Ashlar rock quarry faced</p> <p>d) Ashlar facing</p> <p>Use : This high grade superior quality and costlier masonry. The exposed faces of walls are constructed .</p>	02
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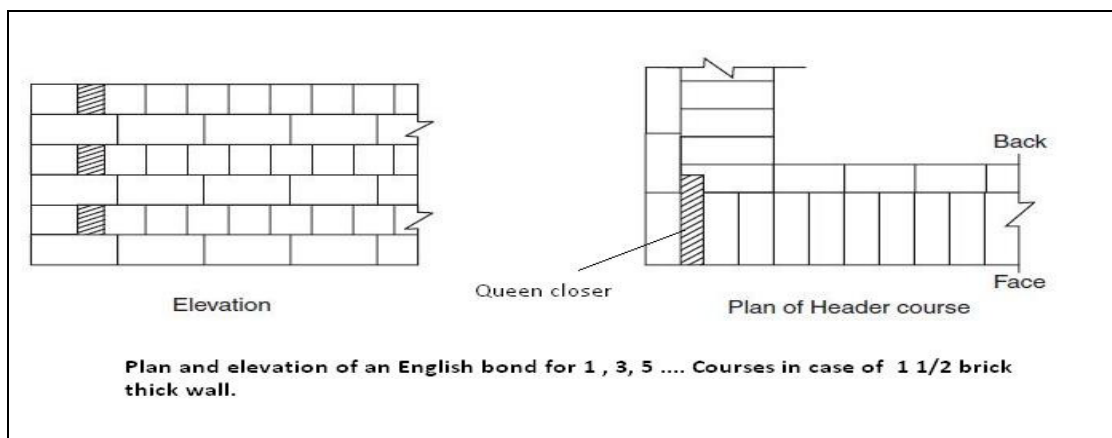
## a) Comparison: English bond and Flemish bond.

Sr. No.	English Bond	Flemish Bond
01	Not pleasing appearance of facing	Better appearance of facing
02	No strict supervision & skill required for its construction	Good workmanship and careful supervision is required
03	More costly than Flemish	Less costly than English as more brick bats are used
04	More compact and stronger for walls having thickness more than $1\frac{1}{2}$	Less compact and stronger

1  
1  
1  
1

(Any 4 points of comparison= 1 Mark each)

## b) Plan and elevation of an English bond for 1, 3, 5.... Courses in case of $1\frac{1}{2}$ brick thick wall.



4

## c) Different types of staircases and plan of any one type.

Types of stairs

- |   |                              |
|---|------------------------------|
| 1. Straight Stairs                            | 2. Quarter Turn Stairs       |
| 3. Half Turn Stairs (Dog-legged OR Open well) | 4. Three Quarter Turn Stairs |
| 5. Circular Stairs                            | 6. Spiral Stairs             |
| 7. Curved Stairs                              | 8. Bifurcated Stairs         |

( $\frac{1}{2}$   
Mark  
for any  
four  
types)

Plan of any one type

2



<p>d)</p>	<p><b>Needle scaffolding with sketch.</b></p> <p>This is also called as Cantilever Scaffolding. In this type of scaffolding, formwork is supported by a series of cantilever beams or needle beams (i.e. timber beams projecting from walls) passing through window openings or through holes in wall.</p> <p>This type of scaffolding is necessary under following circumstances:</p> <ol style="list-style-type: none"> <li>1. Where it is not possible to fix the standards into the ground in usual manner.</li> <li>2. Where the scaffolding is to be provided on the side of a busy street without obstructing the traffic on the road.</li> <li>3. Where scaffolding is required for construction operations of upper storeys of a tall building.</li> </ol> <div data-bbox="357 882 1266 1407"> <p style="text-align: center;">Cantilever Scaffolding</p> </div>	<p>2 for explanation</p> <p>2 for Figure</p> <p>2</p> <p>2</p> <p>2</p>
<p>e)</p>	<p><b>Definition: shoring and underpinning.</b></p> <p><b>Shoring:</b> It is the means of providing temporary support to attain stability of the structure which either has become unsafe due to unequal settlement of foundation or has become unstable during alterations of adjacent buildings such as underpinning.</p> <p><b>Underpinning:</b> It is the process of construction of new foundation underneath the existing building for strengthening purpose without endangering the stability of existing structure, during which the existing structure is required to be temporarily supported.</p>	<p>2</p> <p>2</p>



f)

**Procedure of erection of door frame and shutters during construction.**

The door frames and shutters are erected by the following two methods

A) Built in method and B) Prepared Opening Method

**A) Built in method:** In this method, the frame is installed either before or during the construction of the wall. The door frame is fixed at the required place by means of three holdfasts on either side (one each at the top, bottom and the middle). To ensure proper fixing inside the wall, the horns may be provided. To enable easy repairs or replacements, the use of horns is not desirable. The vertical posts are fixed into the floor below by means of metal pins or wrought iron dowels. Before construction of masonry, the outside of the frames coming in contact with the masonry is given a thick coat of coal tar or other waterproofing paint. The cross battens are used to hold the frames in rectangular shape during construction.

**B) Prepared Opening Method:** In this method, the frame is installed after the construction of wall. This method is more preferred than previous method as the frame is less liable to distortion and moisture changes. The superior type of door frames are fixed into the wall opening by this method either flush or rebated. Plugs of suitable size are driven into the wall during the masonry construction. They are sawn off true to the face of jamb. The door frame is fixed in position and nailed to these plugs. Finally the holdfast openings and the bottom pins are grouted.



Q. 5

a)

**ANY FOUR**

**Draw the plan and elevation of a staircase suitable for an overhead water tank.**

4

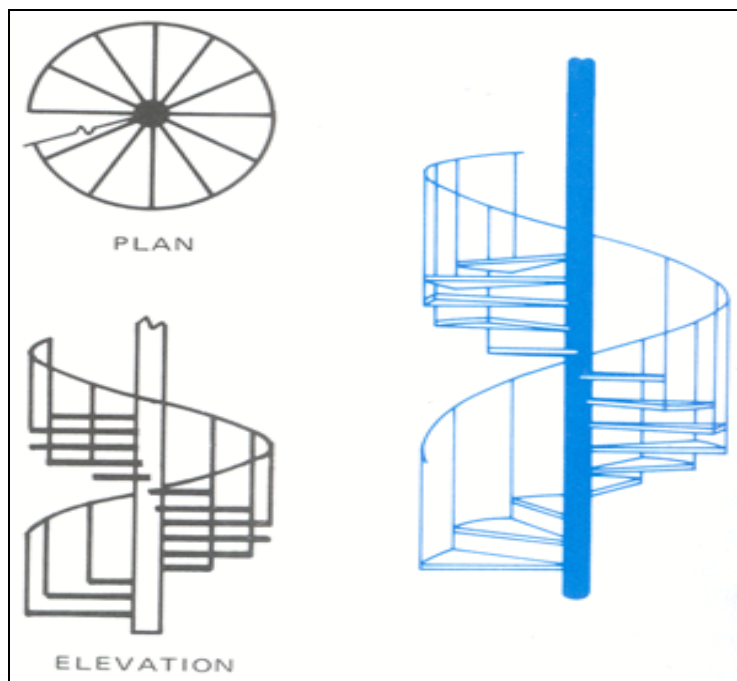


Fig. Spiral Stairs

b)

0.5X8=4

**Procedure of fixing glazed tiles in a bathroom**

1. For construction of glazed tiled flooring, first of all, the ground for receiving the floor is levelled, well watered and rammed,
2. on this a sub-grade of lime concrete (usually 15cm thick) or of RCC is made. Over the subgrade thus prepared, a thin layer (25 mm thick) of lime sand mortar with mix proportions 1:3 (1 lime: 3 sand) or 1:1 cement mortar, is laid to serve as bedding mortar for receiving tiles.
3. The bedding mortar is allowed to harden for few hours and then a neat cement slurry is spread over the surface.
4. At this stage, readymade tiles are laid flat on this surface, with a thin paste of cement applied on their sides. Great care is exercised to see that the sides of the tiles have a thin coat of cement mortar over their entire surface for proper adhesion.
5. Each tile is gently tapped with wooden mallet till its properly bedded and levelled. The joints are made as thin as possible, and extra mortar that comes out of through the joints to the surface is immediately wiped clean with saw dust.
6. After 2 or 3 days, the joints are well rubbed so that slight projections rising above the surface are levelled.



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	<div>7. The entire surface of the floor is then polished with the aid of soft carborundum stone first and with a pumice stone thereafter.</div> <div>8. Finally, the surface is washed with a weak solution of soft soap with worm water.</div>																
c)	<div>Where will you recommend the following types of flooring</div> <table><tr><th>Sr. No.</th><th>Types of flooring</th><th>Recommend for</th></tr><tr><td>I</td><td>Shahabad Flooring</td><td>Where movement of very heavy loads have to be handled.</td></tr><tr><td>II</td><td>Chequered</td><td>To prevent skidding of person walking on it. e.g. Footpaths, Ramps, Nursery Schools, etc.</td></tr><tr><td>III</td><td>Marble</td><td>Where superior type of flooring and extra cleanliness is required. e.g. Residential Bldg, Hospitals, Temples etc.</td></tr><tr><td>IV</td><td>Mosaic</td><td>Commonly used in Operation Theatres, Temples, Bathrooms, and Superior type of building floors etc.</td></tr></table>	Sr. No.	Types of flooring	Recommend for	I	Shahabad Flooring	Where movement of very heavy loads have to be handled.	II	Chequered	To prevent skidding of person walking on it. e.g. Footpaths, Ramps, Nursery Schools, etc.	III	Marble	Where superior type of flooring and extra cleanliness is required. e.g. Residential Bldg, Hospitals, Temples etc.	IV	Mosaic	Commonly used in Operation Theatres, Temples, Bathrooms, and Superior type of building floors etc.	<div>1</div> <div>1</div> <div>1</div> <div>1</div>
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d)	<div>Procedure of external plastering for a building.</div> <div>Generally the external plastering is done in two coats like First coat or rough coat and second coat or fine coat.</div> <div><div>1. <u>First coat or rough coat</u>: Usually the average thickness of first coat of plaster is 12mm on brick maonry or ashlar masonry and 23 mm on rubble masonry. For the first coat cement plaster with mix proportions as 1:3 is generally used.The first coat of plaster is placed between the spaces or bays formed by the screeds on the wall surface. This plaster is applied with mason’s trowels. The surface is then levelled by means of flat wooden floats and wooden straight edges, and finally finished by polishing with trowel. If a second coat is to be applied, the surface of the first coat is not polished, but roughened with scratching tool to form a key for second coat.</div><div>2. <u>Second coat or fine coat</u>: Before applyingthe second coat, the first coat is left to set but not to dry and is roughened to form proper key with the second coat. The second coat consisting of pure portland cement mixed with sufficient quantity of water, is applied after about 6 hours. This second coat is laid in a thin layer of 3mm maximum thickness over the rough and moist surface of the first coat. Finally this coat is well trowled and rubbed smooth.</div></div>	<div>2</div> <div>2</div>															
e)	<div>Describe the procedure of painting a newly plastered surface.</div> <div><div>The paint should always be applied over a perfectly dry surface. But there is sufficient amount of water present with cement plaster is freshly plastered surfaces. The surface completely dries out within a period of 3 to 6 months depending upon the atmospheric condition.</div></div>	<div>0.5X8=04</div>															



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	<ul style="list-style-type: none"><li>• Before applying paint, the plastered surfaces should be given a coat of solution containing glue mixed with water (called sizing) in order to fill cracks, holes, undulations, etc. and reduce suction by the surfaces. In addition, the plastered surfaces may also be given a coat of boiled linseed oil before applying paint.</li><li>• The above mentioned priming coat of boiled linseedoil should not be used if walls has been white washed or colour washed.</li><li>• First two coats should consists of white lead and boiled linseed oil.</li><li>• Third coat should consist of white lead mixed with colouring pigment of desired colour, raw linseed oil and small proportions of turpentine.</li><li>• The forth or finishing coat should contain a large proportion of turpentine with a little varnish to serve as binder and applied when the previous coat is still sticky.</li><li>• Emulsion paints being highly resistant to alkali are directly used over the fresh plastered surfaces in 2 to 3 coats.</li><li>• Cement paints being highly water proofing in character, can also be used for plastered brickwork in cement mortar.</li></ul>	
f)	<b>Explain the uses of following :</b>	2
i	<b>P.O.P:</b> The Plaster of Paris adheres well to wood, metal lath, masonry, gypsum and other plastered surfaces. This material is generally used in combination with ordinary lime <u>for repairing holes and cracks in plastered surfaces and for ornamental work</u> , so it can only be used for interior work.	2
ii	<b>Stucco plaster :</b> Used to give an excellent decorative plaster on both interior and exterior walls. It also provides required texture and smoothness to the platered surfaces.	
Q.6		





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<p>a)</p>	<p><b><u>ANY FOUR</u></b></p> <p><b>Defects in plastering: (Any Four = 1 Mark each)</b> Following defects may arise in plastering:</p> <p><b>1. Cracking:</b> It consists of formation of cracks or fissures in the plaster work due to following reasons:</p> <ul style="list-style-type: none"><li>➤ Structural defects in building and discontinuity of surfaces.</li><li>➤ Plastering on very wet background.</li><li>➤ Old surface not properly prepared.</li><li>➤ Movements in background due to thermal expansions or rapid drying of backing surface.</li><li>➤ Excessive shrinkage of plaster due to thick coat.</li><li>➤ Due to faulty workmanship or method of application.</li></ul> <p><b>2. Blistering or Blowing of plaster:</b> This consist of formation of one or more swellings in small patches over the finished plastered surfaces. This defect is caused due to faulty slacking of lime particles in the plaster after its application.</p> <p><b>3. Falling out of plaster:</b> In this, plaster from same portion of the surface comes off and results in the formation of patches. Such a formation is termed as peeling. This defect may result due to following:</p> <ul style="list-style-type: none"><li>➤ Due to lack of adhesion</li><li>➤ Excessive moisture in background</li><li>➤ Excessive thermal changes either in background or plaster itself.</li><li>➤ Insufficient drying between each coat of plaster.</li></ul> <p><b>4. Efflorescences on Plaster Surface:</b> Efflorescences in the whitish crystalline substance which appears on the surface of walls due to presence of salts in lime, cement, sand, bricks and sometimes even in water. This defect gradually disintegrates the structure. This defect seriously affects the adhesion of paints with the wall surfaces.</p> <p><b>5. Flaking Popping and Crazing:</b> <u>Flaking</u> consists of formation of patches of plaster due to lack of adhesion or failure of bond with the under coat. This results in falling of plaster. <u>Popping</u> consists of formation of conical holes known as pops or blows, in the plastered surface due to presence of a particle substance which expands on being set. <u>Crazing</u> consist of formation of series of hair cracks on plastered surface.</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>
<p>b)</p>	<p><b>Procedure and necessity of pointing.</b> <b><u>Procedure of pointing :</u></b></p> <ul style="list-style-type: none"><li>• All the mortar joints (on the masonry face required to be pointed) are raked out by a special pointing tool to a depth of 15 to 20mm, so as to provide an adequate key for the fresh mortar used for pointing.</li><li>• All the loose mortar and dust are removed by brushes.</li><li>• The joints and the wall surfaces are washed with clean water, and then kept wet for few hours.</li></ul>	



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(ISO/IEC-27001-2005 Certified)

	<ul style="list-style-type: none"><li>• The joints so prepared, are filled up with suitable mortar with a small trowel. The mortar is well pressed into the joints to form a close contact with the old interior mortar joints.</li><li>• The joints are rendered flush, sunk or raised according to the type of pointing required.</li><li>• All excess mortar sticking to the sides are scraped away.</li><li>• The finished pointing work is kept wet for about 3 days when lime mortar is used for pointing and 10 days when cement mortar is used for pointing.</li></ul>	2
	<p><b><u>Necessity of pointing :</u></b></p> <p>The basic necessity of pointing is to protect the joints from weather effects and also to improve the appearance of the building structure.</p> <p>The pointing is necessary under following situations:</p> <ul style="list-style-type: none"><li>• Where it is not required to produce a smooth and even surface. But the surface appearance is exhibited by the pattern of the joints, their thickness, colours, and texture.</li><li>• Where the natural beauty of materials, viz., stone blocks, bricks, etc., is desired to be exhibited to view in the construction.</li><li>• Where good quality materials, viz., stone blocks etc., are used in construction which can stand against the adverse effect of weather. Under these conditions, pointing being cheap, provides balance in economy.</li><li>• Where the workmanship is of good quality and joints can be finished smooth with richer mix.</li></ul>	2
c)	<p><b>Define guniting and grouting. Name the materials used for it.</b></p> <p><b><u>Guniting</u></b> : It is the technique of forcing or injecting an intimate mixture of cement, fine aggregate and water through a cement gun and applying the shot by means of compressed air into the joints or cracks to make the surface waterproof.</p> <p>Material used: Cement, sand (Cement: Sand= 1:3), water.</p> <p><b><u>Grouting</u></b>: It is the technique of applying cement grout (mixture of cement, fine sand and water) of standard consistency under pressure, into the cracks, joints of the structure so as to fill them.</p> <p>Material used: cement grout (mixture of cement, fine sand and water)</p>	2  2



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<b>d)</b>	<p><b>Causes of settlement of a structure and the remedial measures to avoid it.</b></p> <p><b><u>Causes of settlement of a structure :</u></b></p> <ol style="list-style-type: none"><li>1. Liquefaction during earthquake.</li><li>2. Excessive expansion and contraction of underlaying soil.</li><li>3. Deep excavation or piling in neighboring construction.</li><li>4. Lowering of watertable.</li><li>5. Compaction due to shocks and vibration.</li><li>6. Continuous consolidation under heavy static loads.</li></ol> <p><b><u>Remedial measures to avoid settlement:</u></b></p> <ol style="list-style-type: none"><li>1. Proper care should be taken while designing the footing to carry and safely transfer the upcoming loads to the subsoil.</li><li>2. All necessary soil stabilizing treatments should be given, if required to avoid liquefaction.</li><li>3. If the building is located near mining area the sand pile should be dig around the structure, by keeping some distance from building, to damp the shoks or vibrations.</li><li>4. While designing the substructure, the proper factor of safety should be considered.</li><li>5. As for as possible, while selecting the site for structure, the bearing capacity test should be carried out to know exact SBC of soil for that particular site.</li></ol>	<p>1/2 for any four causes</p> <p>1/2 for any four</p>
<b>e)</b>	<p><b>Types of cracks in a building . State causes of it.</b></p> <p><b>Types of cracks in a building:</b></p> <ol style="list-style-type: none"><li>1. Vertical cracks</li><li>2. Horizontal cracks</li><li>3. Digonal cracks</li><li>4. Toothed cracks</li><li>5. Irregular or random cracks</li></ol> <p><b>Causes of Cracks :</b></p> <ol style="list-style-type: none"><li>1. Due to moisture change</li><li>2. Due to creep and elastic deformation</li><li>3. Due to movement of ground</li><li>4. Due to vegetation</li><li>5. Due to temperature variation</li><li>6. Due to effect of chemical reaction</li></ol>	<p>1/2 for any four</p> <p>1/2 for any four</p>



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f)	<p><b>Define 'plinth protection'. Give its necessity</b></p> <p>Plinth Protection: It is the process of giving extra strength to the plinth to protect it from various weathering effects, structural failures and from some burrowing animals.</p> <p>Necessity:</p> <ol style="list-style-type: none"><li>1. To protect the plinth from various weathering agents like rain water, frost etc.</li><li>2. To avoid the differential settling.</li><li>3. To avoid cracking of plinth in expansive soil like black cotton soil.</li><li>4. To prevent entry of dampness into plinth and building.</li></ol> <p>-----</p>	<p><b>2</b></p> <p><b>1/2</b></p> <p><b>1/2</b></p> <p><b>1/2</b></p> <p><b>1/2</b></p>
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**Note for Examiner:** In the above answers if students are writing some additional points or information which may be correct but not included in the model answer sheet. Examiners are requested to go through each answer carefully.