MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION
(Autonomous)
(ISO/IEC -270001 – 2005 certified)

WINTER -2019 EXAMINATION **SUBJECT CODE: 22304**

MODEL ANSWER

Important Instructions to examiners:

1) The answer should be examined by keywords 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 error such as grammatical, spelling errors should not be given more importance.

4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figure drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.

5) Credits may be given step wise for numerical problems. In the some cases, the assumed constants values may vary and there may be some difference in the candidate's 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.

Que. NO	Answer with question	Mark
Q. 1	**Attempt any FIVE of the following**	**10 Marks**
a)	**State the classification of building as per National Building Code Part III 2005.**	
Ans.	Classification of building (as per NBC) 1. Residential Building, 2. Educational Building, 3. Institutional Building, 4. Assembly Building, 5. Business Building, 6. Mercantile Building, 7. Industrial Building, 8. Storage Building 9. Hazardous Building	**1 Mark each** **Any 2**
b)	**State any two purposes of Plinth**	
Ans.	**Purposes of Plinth:** 1. To prevent entry of flood water into building. 2. To avoid dust, Insects, Reptiles, etc entries inside the building 3. To facilitate easy drainage of sewage water. 4. To enhance appearance of building 5. To support the superstructure wall & transfer load to footing. 6. To prevent from dampness. 7. To support flooring tiles.	**1 Mark each** **Any 2**
c)	**Define job layout**	
Ans.	**Job Layout:** A systematic arrangement of various jobs / resources required for construction project around it, are chalked out on drawing so as to achieve economy, Safety & convenience.	**2 Marks**
d)	**List two purposes of shoring**	
Ans.	**Purposes of Shoring :** Shoring is the construction of a temporary structure to support temporarily an unsafe structure. 1. To repair bulging out wall. 2. To repair the cracks in the wall. 3. To dismantle adjacent structure. 4. To make openings in existing wall.	**1 Mark each** **Any 2**
e)	**Define underpinning**	
Ans.	**Underpinning :** The process of placing a new foundation under an existing one or strengthening an existing foundation is called underpinning of foundation.	**2 Marks**
f)	**Enlist functions of Sill and Lintel**	
Ans.	**Functions of Sill:** 1. To prevent the exposed masonry wall top from weathering. 2. To support the frame of window / Door. 3. To give good finish to wall openings **Functions of Lintel:** 1. To transfer the load of wall above the opening to side. 2. It holds chajja. 3. To prevent load on frame. 4. To strengthen the wall.	**1 Mark** **Any 1** **1 Mark** **Any 1**

g) **State two necessities of Demolition.**

Ans. **Necessities of Demolition :** — **1 Mark each**

1. Existing building is not capable to serve the purpose.
2. Existing building is deformed / distorted beyond repair.
3. Existing building life is finished.
4. Existing building is likely to fail / Unsafe.
5. Existing building Expansion / Rectification is not possible.

Any 2

Q. 2 **Attempt any THREE of the following:** — **12 Marks**

a) **Compare load bearing structure and framed structure. (four points)**

Ans.

Load Bearing Structure	Framed Structure
1. Load of slab/ roof is transferred through wall to foundation.	1. Load of slab / roof is transferred through column to foundation.
2. Walls are thick about 0.45 m	2. Walls are thin about 0.1 m
3. Structure is not flexible.	3. Structure is flexible.
4. Structure weight is heavy.	4. Structure weight is light.
5. Less resistant against earthquake force.	5. More resistant against earthquake force.
6. Height is limited up to 3 storeys.	6. Skyscraper building can be constructed.
7. High bearing capacity foundation soil is required.	7. Can be constructed on any type of soil.
8. Heavy load on foundation.	8. Light load on foundation.
9. More time is required for construction.	9. Less time is required for construction.
10. Less carpet area.	10. More carpet area.
11. More material required.	11. Less material is required.
12. Costly structure.	12. Economic Structure.

1 Mark each

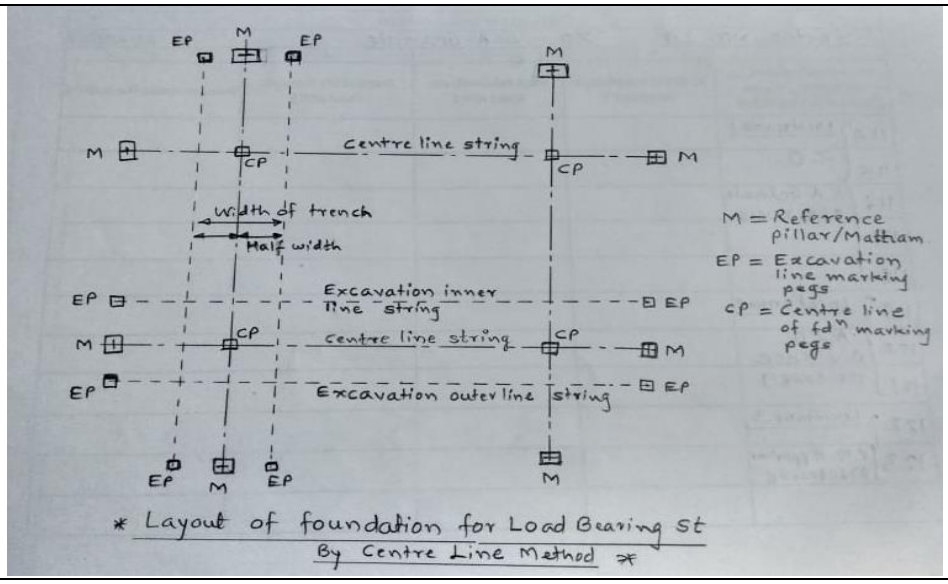
Any 4

b) **Explain the foundation layout of load bearing structure by centre-line method.**

Ans. Foundation layout of load bearing structure by centre line method:

1. One corner of the foundation plan is fixed by measuring the distance from the border of the plot and wooden peg with a nail on the top is fixed to make the first corner of building.
2. From first corner, centre line of foundation is marked with peg.
3. Half width of foundation on either side is marked with peg.
4. Centre line of foundation of wall is set with base line string considering orientation of building.
5. Perpendicular centre line is set with string passing through first building corner centre line peg.
6. All distances on string are measured and pegs are marked.
7. Diagonal distance between pegs is verified on the site as per drawings and if not, then markings are shifted to do find correct.
8. Excavation lines are marked with lime sand powder on either side of centre line string.
9. Centre lines are extended and marked, construct pedestal @ 0.6 m height on the ground and about 2.0 m distance away from centre line. Pedestal top are marked with nail / cross line on plaster for further reference to establish centre line.

3 Marks



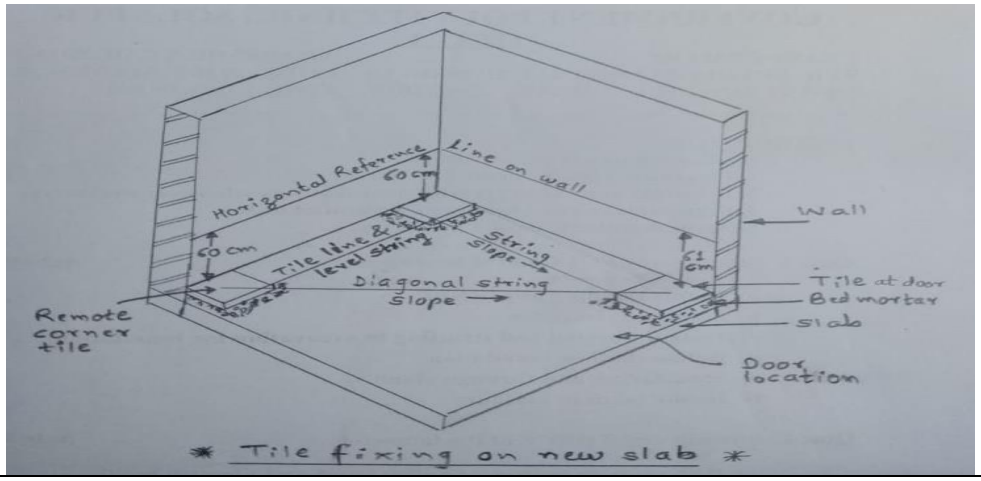
1 Mark

c) Describe the procedure of laying a floor finish on a newly constructed slab.

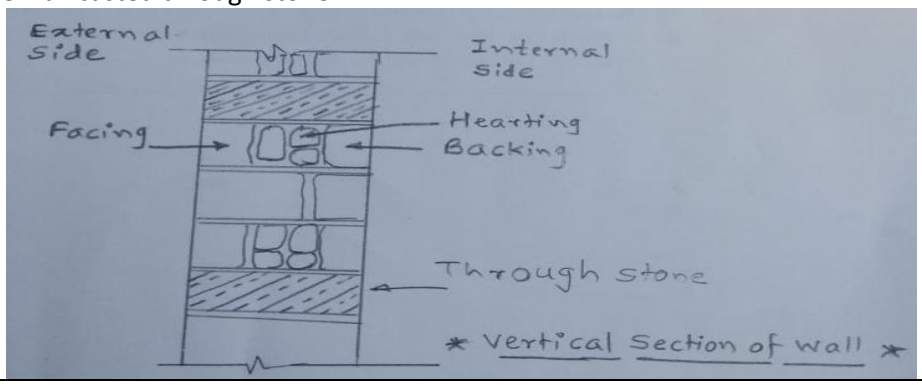
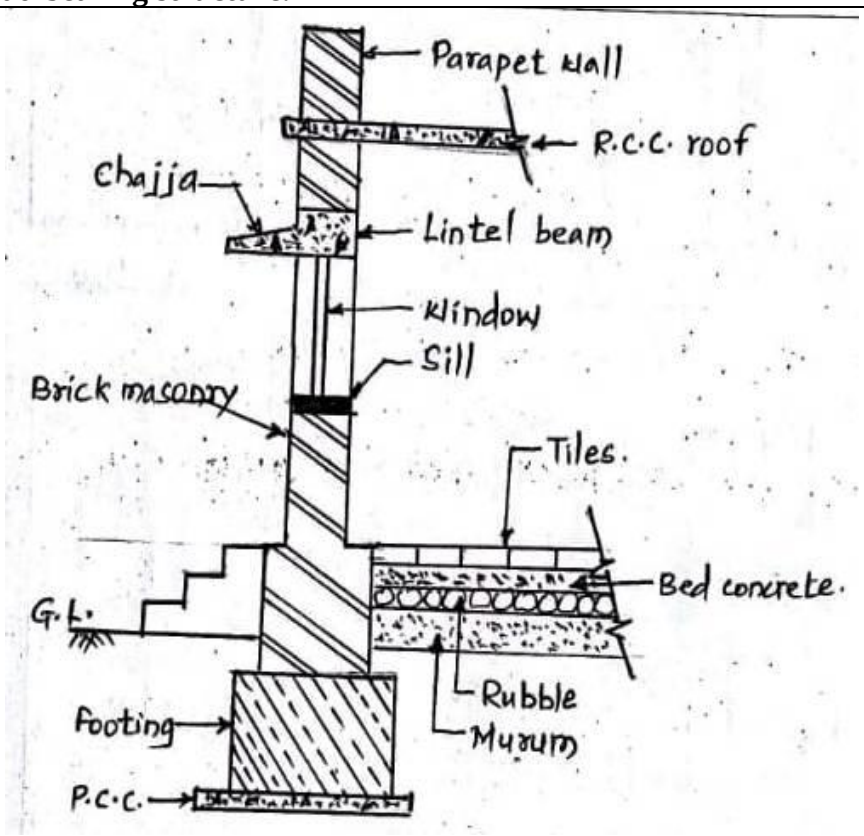
Ans.

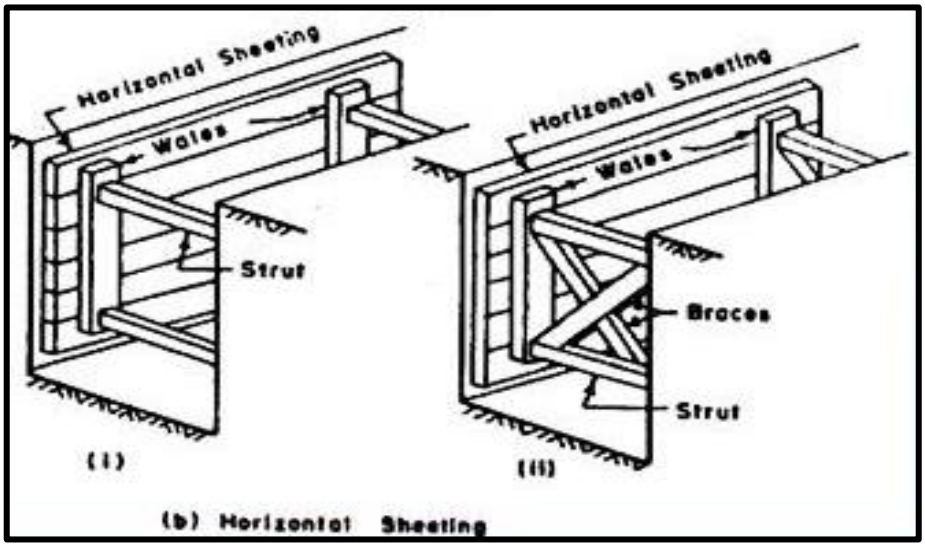
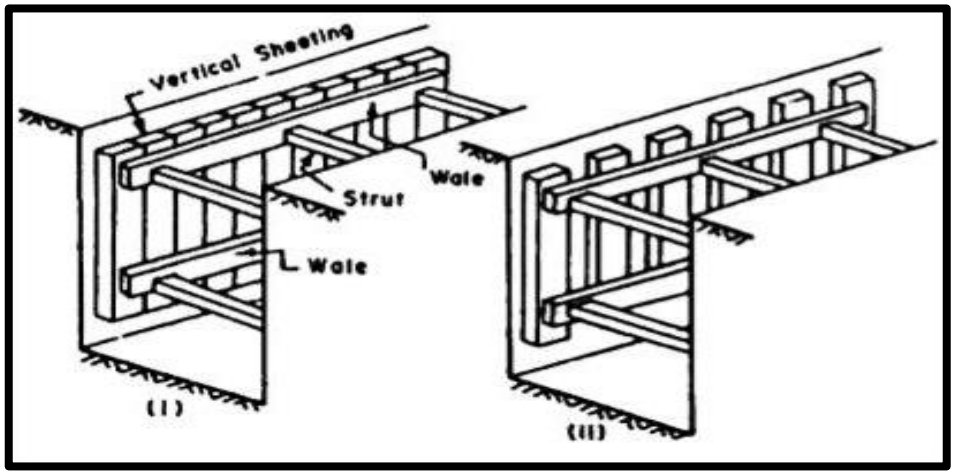
1. Slab is cleared off from loose mortar deposited during plaster work and level the surface.
2. Chalk out the marking on wall @ 0.6 m above the slab surface in one level.
3. Construct mortar dots at four corners of wall to required thickness of bedding for tiles (15 X 15 cm or as per tile size)
4. Place the tile at remote corner i.e. at highest position of tile required and check the vertical distance from reference line as required for maintaining required level / slope towards door, by adjusting mortar bedding thickness, check level of tile top with spirit level.
5. Place another tile at opposite corner and follow same procedure as per point no 4 and similarly for all corners.
6. Check diagonal level of tying the by string from corner tile and central tile for reference is fixed.
7. Lay mortar bedding strip between two remote corner and lay the tile in line and level.
8. Repeat point no 7 procedure up to door corner.

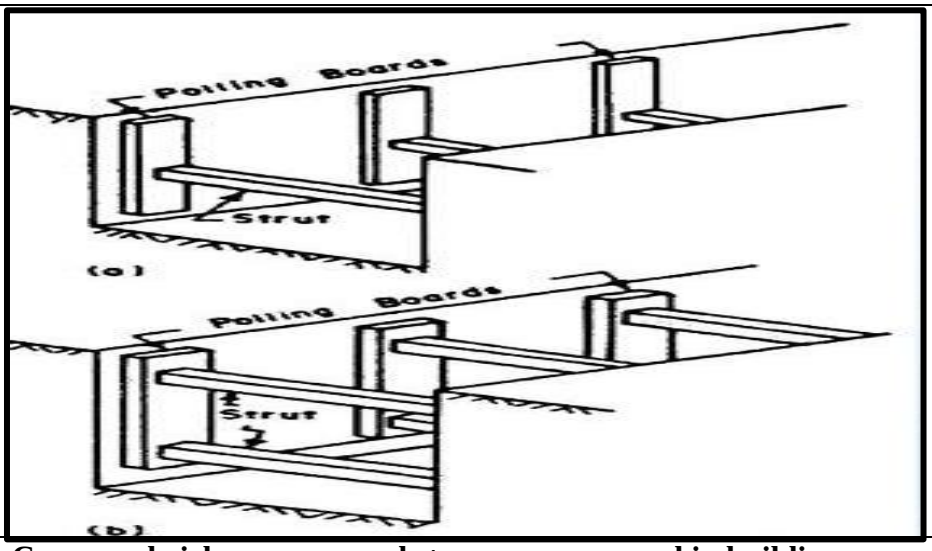
3 Marks



1 Mark

d)	**Define facing, backing, hearting and Through stone with neat sketch.**	
Ans.	**Facing:** The material used in the face of the wall is known as facing. **Backing:** The material used in the back of the wall is known as backing. **Hearting:** The inner portion of the wall between the facing and backing is known as hearting. **Through stone:** A header stone having length equal to wall width is placed across the wall casted through stone.  	**½ Mark** **½ Mark** **½ Mark** **½ Mark** **2 Marks**
3.	**Attempt any THREE of the following:**	**12 Marks**
a)	**Draw a neat labeled section of a wall from foundation to parapet wall for load bearing structure.**	
Ans:	 **Section Of wall from Foundation to Parapet wall For Load Bearing Structure**	**4 marks** **(2 marks for sketch & 2 marks for labeling)**

b)	**Explain timbering and strutting in excavation with neat sketch.**	
Ans:	A method of giving the temporary support to the side of deep trench or when subsoil is loose or very soft is known as timbering (i.e. shoring) and strutting. It consists of timber planks and strut to give temporary support to the side of trench. When the depth of trench is large, or when the sub-soil is loose, the sides of the trench may cave in. The problem can be solved by adopting a suitable method of timbering. Timbering of trenches, sometimes also known as shoring consists of providing timber planks or boards and struts to give temporary support to the sides of the trench. Timbering of deep trenches can be done with the help of the following methods: 1. Stay bracing. 2. Box sheeting 3. Vertical sheeting 4. Runner system 5. Sheet Piling	**2 marks**
		**2 marks** **(Any one sketch)**
		



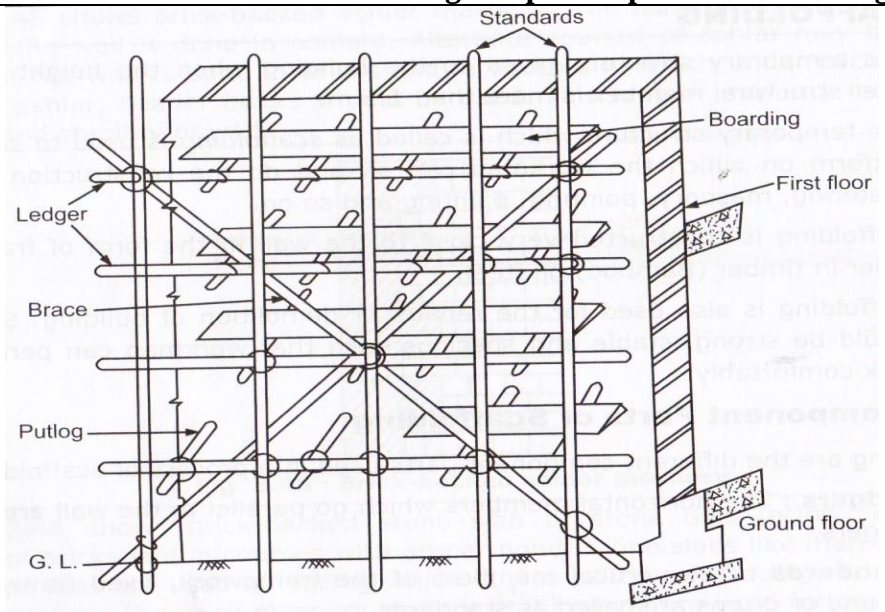
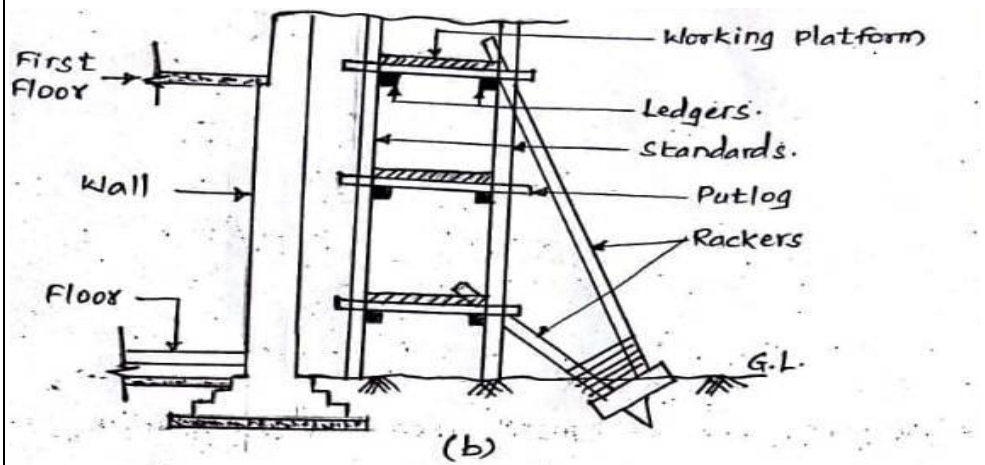
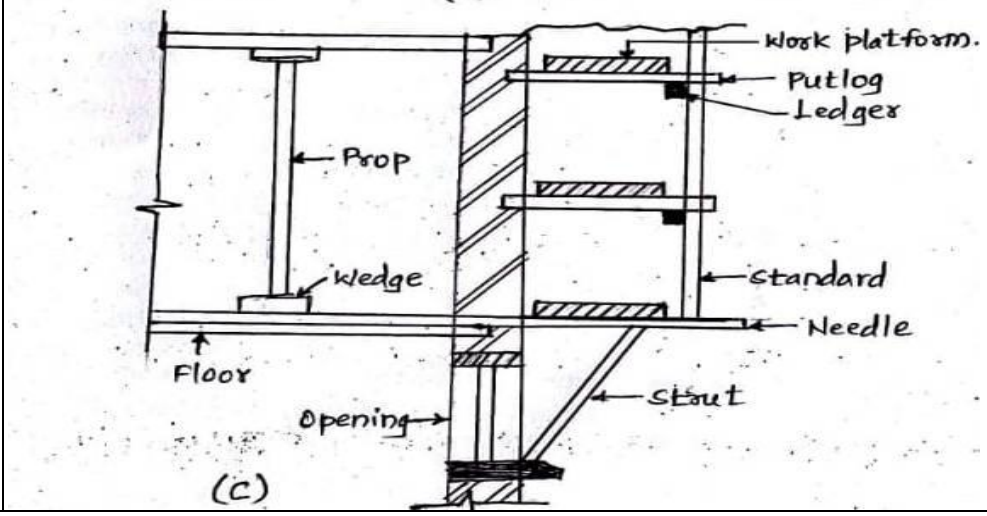
c) **Compare brick masonry and stone masonry used in building construction.**

Ans:

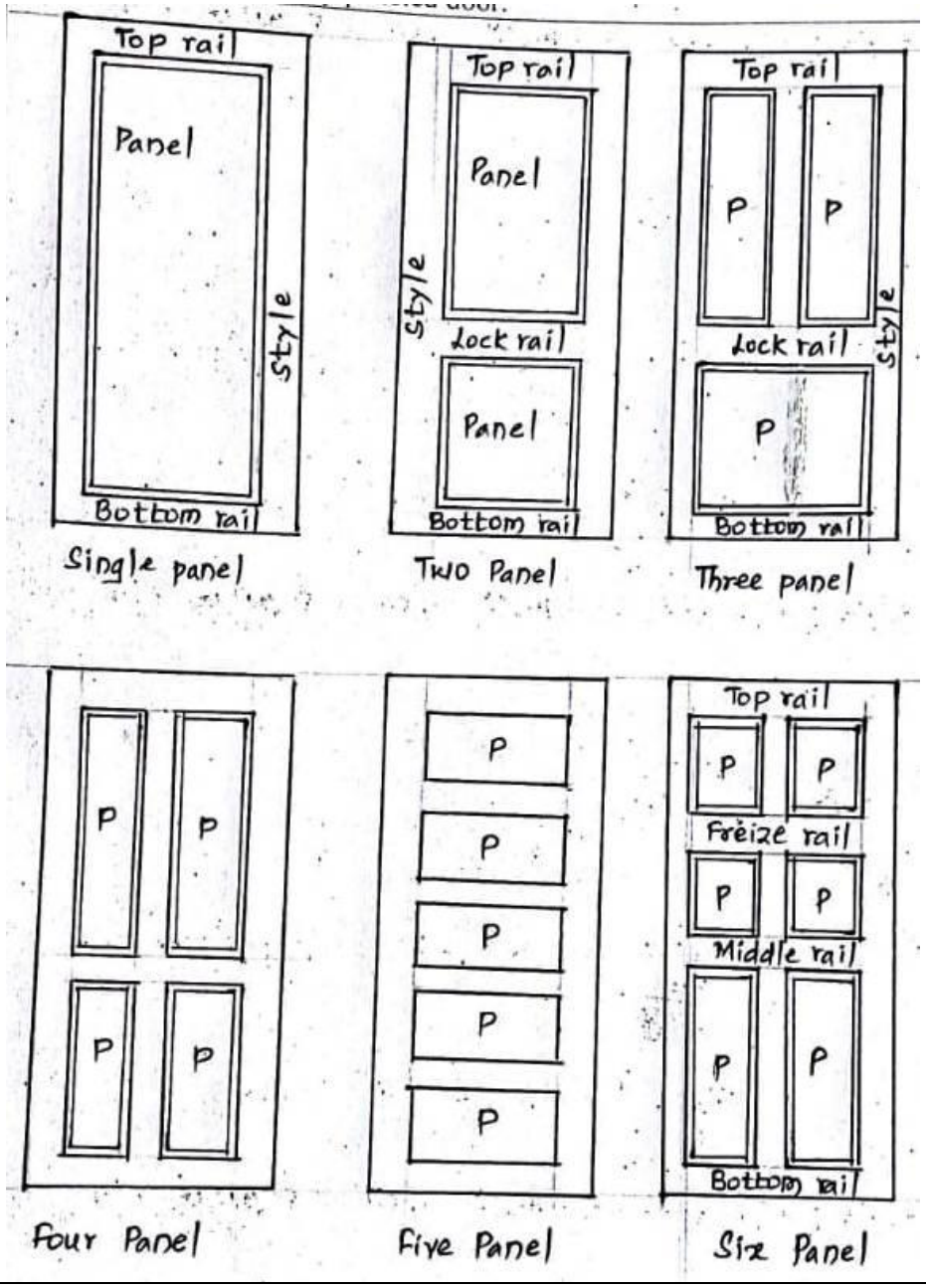
Sr. No.	Brick Masonry	Stone Masonry
1.	It is less stronger than stone masonry.	It is stronger than brick masonry.
2.	It is cheaper in places where clay is available in abundance.	It is cheaper in places where stone is available in abundance.
3.	Brick masonry offer better fire resistance than stone masonry.	Stone masonry offers less fire resistance.
4.	Brick masonry gives less aesthetic view.	Stone masonry gives more aesthetic view than brickwork.
5.	It is less watertight than stone masonry.	It is more watertight than brick masonry.
6.	Mortar required in brick work is less.	Mortar required in stone work is more.
7.	Cost of construction is less than stone masonry.	Cost of construction is more than brick masonry.
8.	It does not require skilled labour.	It requires skilled labour.
9.	Dressing is not required	Dressing is required
10.	Brick lifting devices are not required	Stone lifting devices are required
11.	Single scaffolding is used	Double scaffolding is used
12	Plastering is required	Plastering is not required

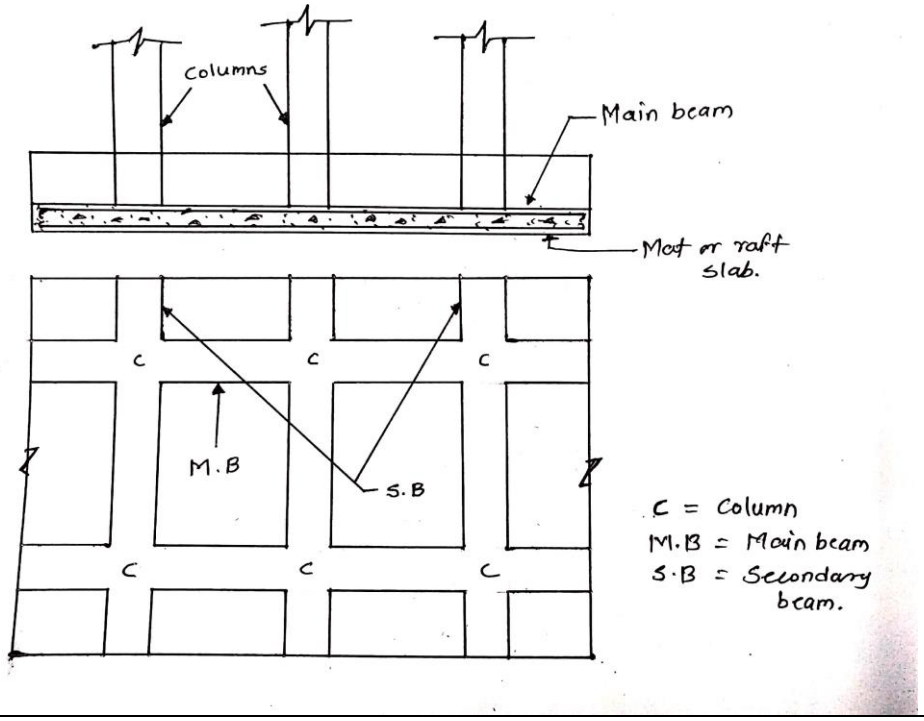
1 mark each

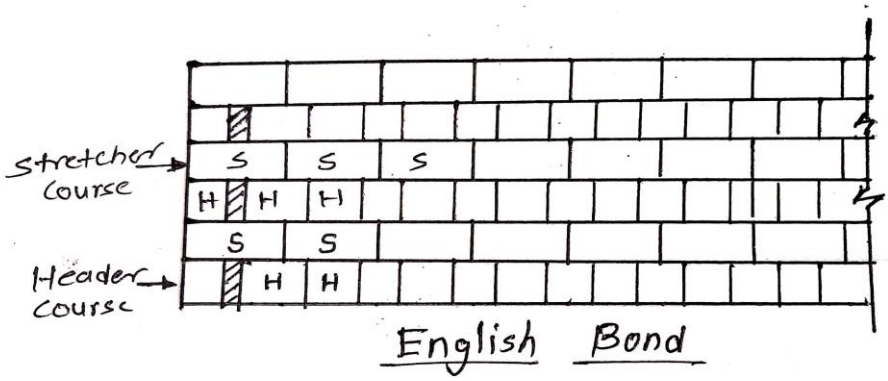
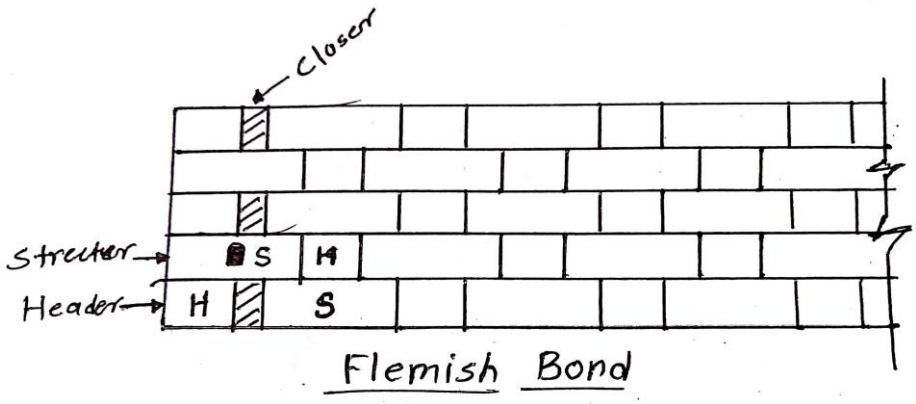
(Any four points)

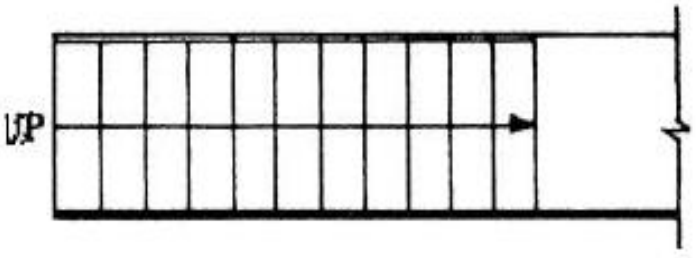
d)	Draw a neat labeled sketch showing component parts of scaffolding.	
Ans:	  	**Any one sketch** **(2 marks for sketch & 2 marks for labeling of components)**

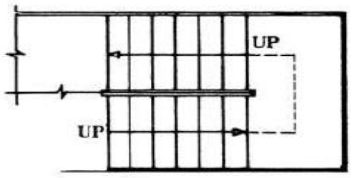
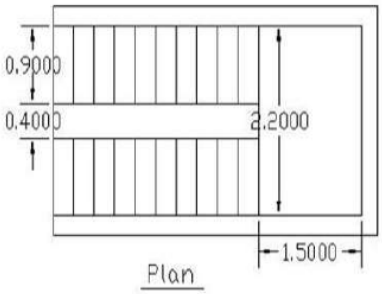
4.	**Attempt any THREE of the following:**	**12 Marks**
a)	**State the necessity of providing** **(i) Combined column footing and** **(ii) Raft foundation**	
Ans:	(i) Combined column footing:- A combined footing provided as a column for two or more columns in a row. Combine footing is also provided when the columns are very near to each other and isolated footing of these column will overlap on each other. (ii) Raft foundation:-It is suitable where ground is soft, Clayey or marshy having low bearing capacity, and where sub soil water conditions are uncertain. The raft foundation is also used to reduce settlement above highly compressible soils. When total individual footing area of all columns exceeds 50% of built up area of building at ground floor.	**2 marks** **2 marks**
b)	**Define formwork and state the requirements of a good formwork.**	
Ans:	**Formwork:** It is a temporary ancillary construction used as a mould for the structure, in which concrete is placed and in which it hardens and matures. Following are the requirements of good formwork:- 1. It should be strong enough to resist weight of concrete, workers and machinery. 2. It should be economical, compared to total cost of construction. 3. It should give smooth finish and shape to concrete faces. 4. It should be easily and locally available. 5. Its self weight should be less. 6. It should be possible to transport the formwork easily. 7. It should be possible to erect and dismantle the formwork very easily. 8. It should be possible to use the formwork for more number of times. 9. It should be possible to give the required geometrical shape to the formwork. 10. It should be rigid enough to retain its shape without any deflection beyond permissible limits. 11. It must be constructed so tight that it does not allow the cement paste to leak through the joints.	**1 mark** **3 marks** **(Any three)**
c)	**State the precautions to be observed in stone masonry construction.**	
Ans:	Following are the precautions to be observed in stone masonry construction: 1. Stone used in masonry should be well seasoned, hard, tough, uniform in texture. 2. Stones used should be free from defects like cracks, cavities and patches of loose or soft materials. 3. Proper bond should be maintained throughout the masonry. 4. The vertical joints should be staggered.	**1 mark each** **(Any four points)**

	5. The vertical surface should be truly in plumb. 6. The stones to be used in masonry must be well watered before use. 7. The masonry work should be cured for at least two weeks. 8. Normally, the load or weight should act axially and centrally on masonry sections. 9. Every stone in ordinary walls should be bedded on the natural bed. 10. The exposed joints of the masonry should be properly pointed by mortar.	
d)	**Draw neat sketch of fully paneled door.**	
Ans:		**3 marks for sketch and 1 mark for labeling** **(Any one diagram)**

e)	**State the necessity and importance of waterproofing in building construction.**	
Ans:	Necessity and importance of waterproofing in building construction: 1. It prevents leakage in the structure. 2. It prevents the entry of water into the structure. 3. It keeps the structure dry. 4. It reduces the maintenance cost of building. 5. It prevents the building to become inhabitable and unsafe. 6. It increases the life of building.	**1 mark each** **(Any four points)**
Q.5.	**Attempt ANY TWO of the following**	**12 Marks**
a)	**Suggest relevant type of foundation with sketch for a residential building with Marshy soil at greater depth with justification and explanation.**	
Ans:	Raft foundation is suitable for a residential building with Marshy soil at greater depth It is suitable where ground is soft, Clayey or marshy having low bearing capacity and where sub soil water conditions are uncertain. The raft foundation is also used to reduce settlement below highly compressible soils It proves to be to be economical under waterlogged area where pile foundation cannot be used advantageously and independent column footing becomes impracticable. Raft is acting as a floor consisting of thick reinforced concrete slab covering the entire area of the bottom of the structure.  	**1 Mark** **1 Mark** **1 Mark** **3 marks (for Sketches)**

b)	Describe in brief with neat sketch: i) English bond ii) Flemish bond	
Ans:	**English bond :** The Bond with alternate courses of headers and stretchers with a closer-placed next to quoin header is called as the English Bond. Points Should be Remembered for English bond: 1. A heading course should never start with a queen Closer. 2. There is no continuous vertical joint. 3. Walls of even number of half bricks in thickness present the same appearance on both faces. 4. Walls of odd numbers of half bricks in thickness will show each course comprising of headers on one face and stretchers on another face.	**2 Marks**
		**1 Mark**
	Flemish Bond: The Bond which consists of the alternate header and stretcher in the course is called as Flemish Bond. Points should be remembered for Flemish bond. 1. It starts with a header at the corner. 2. The vertical joints are staggered in each course. 3. Flemish Bond appears more attractive and pleasing but it is less stronger and compact than English Bond. 4. Flemish Bond is slightly economical as a number of brick bats can be used.	**2 Marks**
		**1 Mark**

c) i)	**Suggest commonly adopted sizes of door for:** **1) Internal door of residential bldg.** **2) Door of garage for car park**	
Ans:	1) Internal door of residential bldg. - 900 X 2100 mm 2) Door of garage for car park. – 2250 X 2250 mm	**1 Mark each**
c) ii)	**Suggest most suitable types of window for** **1) Residential bungalow** **2) cinema hall** **3) School** **4) Enclosed RCC Staircase**	
Ans:	1)Residential bungalow – Bay window/ Casement window/Sliding window 2) Cinema hall – Fixed window 3) School – Sliding window / Casement window / Steel Window 4) Enclosed RCC Staircase – Fixed window with louvers	**1 Mark each**
Q.6.	**Attempt any TWO of the following:**	**12 Marks**
a)	**Enlist different types of staircase. Explain any one type with a neat sketch.**	
Ans:	**Types of Staircase:** 1. Straight Stair 2. Dog legged Stair 3. Quarter turn Stair 4. Open well Stair 5. Three quarter turn Stair 6. Bifurcated Stair 7. Geometrical Stair 8. Circular Stair 9. Spiral Stair **1. Straight Stair** These are the stairs along which there is no change in direction of any flight. It is used where stair case hall is long and narrow  	**3 Marks** **(Any 6)** **01 mark** **02 marks**

	Or **2. Dog legged Stair: -** It consists of two straight flights of steps with 180 degree (Half turn) between them. A level landing is placed across the two flights at the change of direction. This type of stair is useful where the width of the staircase hall is just sufficient to accommodate two width of stair.  **Or** **3) Open well Stair:** In these type of stair there is a well or opening between the flights in plan. This well may be rectangular or of any geometrical shape and it can be used for fixing lift.  	**Or** **01 mark** **02 marks** **Or** **01 mark** **02 marks**
b) i)	**Explain the procedure of internal plastering a newly built brick wall.**	
Ans:	**Procedure :** The mix ratio of mortar in case of cement plastering depends upon the nature of the work to be plastered. For rich plastering work at sensitive places (e.g. in side bathrooms, W.C. etc.), 1:3 cement plaster mix is used. For general plastering of walls 1:4 to 1:8 cement mortar is used. **<u>Preparing the surface</u>** • Before applying the plaster, the surface of wall shall be cleaned, free from loose particles/dust and wet in advance. • The joints of masonry are properly raked to a depth of 10 to 15 mm to provide key and bonding between wall and plaster. • All the cavities and holes in the wall should be properly filled up in advance. • When the surface is ready, plaster is applied.	**01 Mark**

	Applying the plaster • Cement plastering may be applied in one or two coats. • In case plastering is to be done in two coats the first coat is applied as described below: • The mortars screed or bands and patches (dots) of plaster of required thickness shall be made on the surface vertically and horizontally at center to center distance of 2 M and evenness of plastered surface shall be checked by plumb bob and plain wooden rule. • The mortar is dashed against the prepared surface into a uniform thickness with the help of trowel. • Surplus mortar is removed with the help of mason's straight edge and then the mortar is pressed well with a wooden float so that mortar may fill in the joints of the masonry. • The thickness of this coat should not be more than 16 mm. • Before applying the second coat, the first coat is allowed to set but it should not become dry and it is also roughened with a scratching tool to provide key to the second coat. • The second coat is then applied in a thin layer not exceeding 3 mm in thickness within48 hours. • It is then well trowelled and rubbed perfectly smooth with the help of a steel float. It is then allowed to set for 2 days and cured for more than 8 to 10 days. **Note: Marks may be given to figure of dots and screeds.**	**02 Marks**
b) ii)	**State the necessities of painting.**	
Ans:	**Necessities of painting :-** • Necessity of painting it protects the surface from weathering effect of the atmosphere. • It prevents decay of wood and corrosion in metal. • It gives good appearance to the surface. Decorative effect maybe e created by painting and the surface becomes hygienically good, clean, colorful and attractive. • Due to painting the life of material increases. • Due to painting cleaning of the surface becomes easy. • Painting imparts sanitation and improved illumination.	**01 Mark each** **(Any 3)**
c) i)	**Explain in brief Guniting and Grouting.**	
Ans:	**Guniting-**Process of applying cement and sand (1:3) mixture under pressure (20 -30N/cm2)on concrete surface in order to repair concrete work. It is a process of repairing concrete work or damaged surface using mortar under pressure. Guniting is a process of applying mortar pneumatically. **Grouting**- Process of placing grout material (cement+sand+admixtures if any) in existing cracks or cavities it is a thin mortar used to fill cracks and cavities in masonry. The process of placing a grout material into cavities of concrete or masonry is called grouting.	**1½ Marks** **1½ Marks**

c) ii)	**State the various causes of settlement of structure.**	
Ans:	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 6. Expansive soils such as black cotton soil 7. Vibrations, if it is factory foundation, or a building vary near to railway tracks 8. Liquefaction during Earthquakes and floods 9. Elastic compression, plastic flow or consolidation under static load 10. Undermining of soil below the foundation	**½ Mark each** **(Any 6)**