SUMMER- 19 EXAMINATION

Subject Name: BUILDING CONSTRUCTION **Model Answer** Subject Code: 22304

Important Instructions 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 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 some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgment on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q. No.	Sub Q. N.	Answers	Marking Scheme
Q.1	a) Ans	***Attempt any Five:*** **State any two building components with their function.** Following are the Components of building – 1. **Foundation** : a) The function of foundation is to transfer the load of the building upto the hard strata which can support it without settling down. b) Foundation also helps in spreading the load over a large area to decrease the load intensity. 2. **Plinth**: a) It provides protection from rainwater and crawling animals and insect. 3. **Floor:** a) It provides good resistance to wear and tear occurring due to its daily use. b) It provides leveled surface for comfortable movement. 4. **Walls:** a) Wall form the outer limits of the building and separate the rooms from each other. 5. **Roofs**: a) Roof protect from the elements like rain, sun, wind, frost, snowfall, etc. 6. **Windows:** a) Windows are provided for admission of light and free circulation of air into the building. 7. **Doors:** a) Doors are used for free movement of occupants in and out of the house. b) The outer doors are means of isolating the house from the surroundings from privacy and security point of view. 8. **Beams**: a) It supports the transverse load of building structure. b) It takes tensile load of a structure. 9. **Columns:** a) It gives the support to the floors at various levels in framed structure or RCC structures. b) It takes compressive load of structure. 10. **Sill :**a) It provides a suitable finish to window opening. b) It also affords a protection to the wall below the window. c) It also provides the support to the vertical members of the openings. 11. **Staircase:** a) It provides an easy access from one floor to other. 12. **Parapet:** a) Parapet acts as a protective solid balustrade for the users. b) It acts as a safe guard wall for small children on terrace.	***(10)*** 1 M for each Component & function

		13. **Lintels:** a) It supports the portion of wall over the opening. **NOTE:Marks should be given to other building components or related function also**.	
Q.1	b) Ans	**State any two purpose of foundation.** The purpose of foundation are- 1) To support the structure. 2) To distribute load of the entire structure over a wide spread area, so that the chances of unequal settlement are minimized. 3) To increase the stability of the structure. 4) To provide a leveled surface for super structure. 5) To provide the structural safety to super structure against scouring due to animals, flood water etc. 6) To prevent or minimize the cracks due to movement of moisture in case of weak or poor soils etc.	1M for each (any two purpose)
Q.1	c) Ans	**Describe the terms facing and hearting in stone masonry.** i) Facing – The material which is used in the face of the wall is known as facing. ii) Hearting – The portion of the wall between the facing and backing is known as the hearting.	1M for each
Q.1	d) Ans	**Define the terms Newel post and Headroom in vertical communication.** **Newel post :** This is the vertical member which is placed at the ends of flights to connect the end of strings and hand rail. **Headroom :** The vertical distance between the nosing of one flight and bottom of flight immediately above is known as the headroom.	1M for each
Q.1	e) Ans	**State the function of window sill and lintel.** **a)Sill-** 1. To provide suitable finish to window opening. 2. It also affords a protection to wall below the window 3.It also provides the support to vertical members of the openings. **b) Lintel-** 1. It supports the portion of wall over the opening. 2. They are used to transmit the load to adjacent wall over which they are supported.	1 M for each Function
Q.1	f) Ans	**Define the job layout and site clearance.** **job layout:** A plan in which the arrangement for placing site office, store room, labour quarter, medical aid center, godowns for keeping construction material and other facility are properly prepared is called as job layout or site layout. **Site Clearance:** Site clearance is the process of removing big trees, plant, roots, old construction etc. to prepare a leveled ground for marking of layout.	1M for each

Q.1 g) Ans

State the classification of building as per type of construction. — 2 M

Following are the classification of building as per type of construction:

1. Residential Buildings.
2. Public Buildings.
3. Institutional Buildings.
4. Assembly building.
5. Business Buildings.
6. Industrial Buildings.
7. Storage Buildings.
8. Hazardous Buildings.
9. Framed structure.
10. Load bearing structure.

Q.2

Attempt any three of the following: — **(12)**

a) Ans

Difference between load bearing structure and framed structure(any four points) — 1 M for each (any four)

Description	Load bearing structure	Framed Structure
Sub soil condition	Suitable only when hard strata are available at shallow depth	Suitable for any type of soil
Number of storey's	3 to 4 storey buildings can only be constructed	Multi storey buildings can be constructed.
Load transfer mechanism	In load bearing structure, load transfer path is from slab to walls and walls to footing and footing to sub soil	In framed structure, load transfer path is from slab to beam, beam to column and column to footing and footing to sub soil
Resistance to vibrations	Load bearing structure is less resistant to Earthquake.	Framed structure is more resistant to Earthquake
Carpet area	Carpet area available is less	Carpet area available is more.
Possibility of openings	Limitations for openings in walls.	Large openings in walls are possible.
Thickness of wall	More	less
Time of construction	More	Less
Maintenance cost	More	Less
Flexibility	It is not flexible in design as you can't remove/shift walls.	It is flexible in design as you can shift the location of walls
Materials	Load Bearing walls can be of Brick, Stone, concrete block etc	The frame can be RCC(beam/ Column) frame, I- Section Steel frame, Wood frame etc.

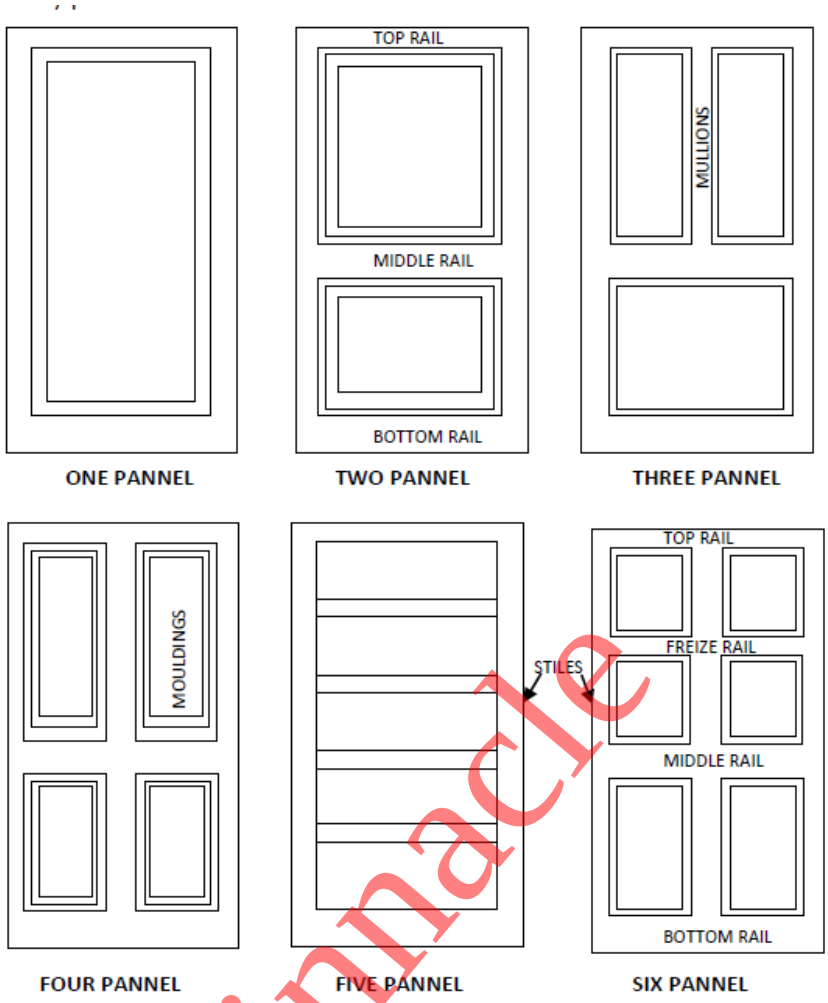
Q.2 b) Ans

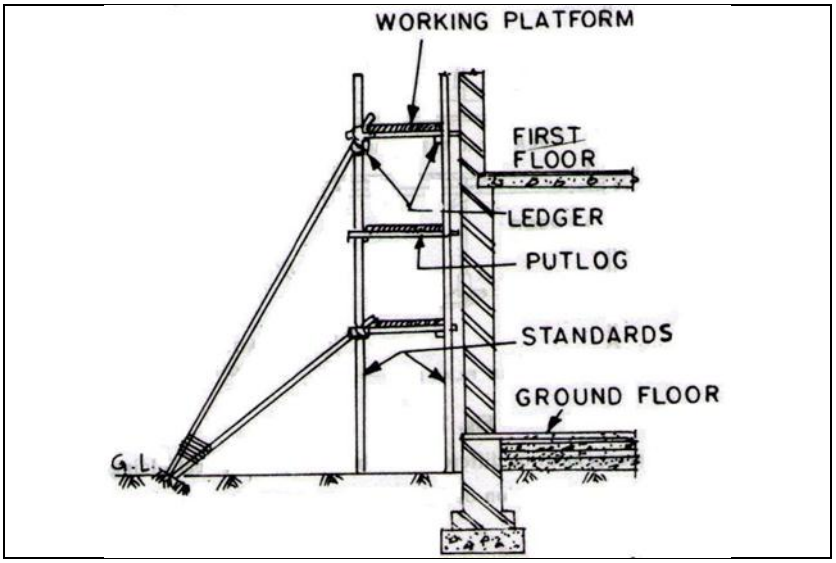
State any four precautions to be taken while marking layout on ground.

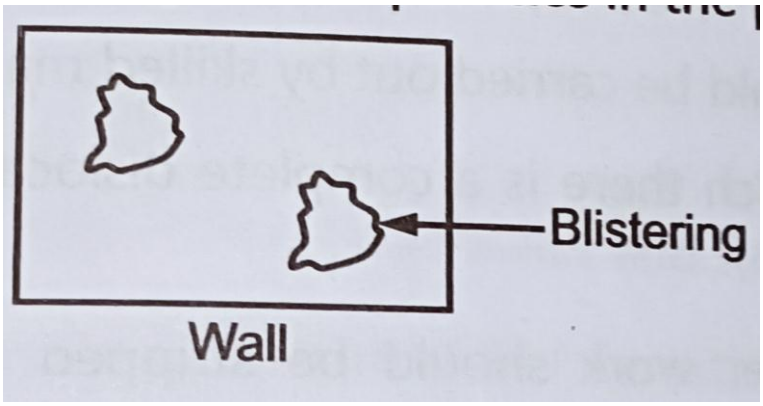
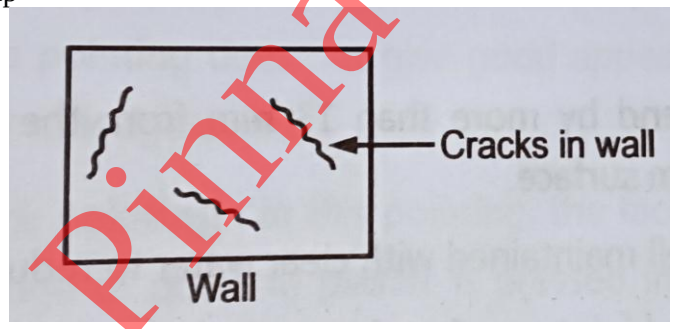
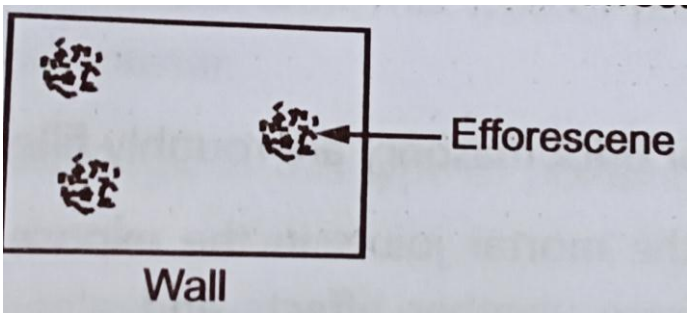
The necessary precaution to be taken while marking layout on ground are as follows

1. All vertical wooden post should be firmly fixed into the ground with concrete and curing should be done to the concrete work for the period of 7 days before fixing horizontal railing.
2. Horizontal wooden planks called as railing should be straight and should have standard size.
3. Joints of the wooden railing should not be overlapped but should be joined by small wooden planks on either side of joint and nailed properly.
4. All vertical post should be kept generally at the same level

		5. Horizontal wooden railing should have same level throughout and leveled should be found either by level tube or dumpy level. 6. Railing should be fixed by the nails of 50 mm in dia. 7. Nails of 40 mm in dia. Should be used for locating the center of column in framed structure and locating the centre of masonry wall in load bearing structure 8. A diagonal check should be done for every day work while locating the centre of column. 9. Strict instruction should be given to the staff and labours not to sit on railing such that bending of railings avoided and it helps for better accuracy 10. Periodical checking should be done by measuring distances of each rail from the face marking or origin 11. Position of nails on the horizontal railing should not be disturbed till the completion of the plinth work 12. All column number i.e. C1, C2, C3 etc. marked on wooden railing should be visible. 13. All the work should be certified by RCC consultant and Architect 14. To prevent the lime powder flowing away with wind action, it should be thoroughly mixed with sand. 15. Marking with lime powder should be clear and distinct to excavate the pits and trenches properly by labour. 16. Measure or check all distances by steel tape. 17. Prepare the location sketch of reference markings. 18. Mark the face line or center line correctly. 19. Use proper or correct plumb bob for centering.	1 M for each (any four)
Q.2	c) ans	**Describe any eight characteristics of good stone masonry.** The requirements of good stone masonry are as follows:- 1. The stones to be used for stone masonry should be hard, tough & durable. 2. The stone should be properly dressed as per the requirement. 3. The headers and bond stones should not be dumbbell shape. 4. It should have low water absorption. 5. It should have resistance against fire. 6. The stone masonry section should always be designed to take compression & not the tensile stresses. 7. It should have adequate resistance against weathering action. 8. Headers or through stones should be provided at regular interval 9. Proper bond should be maintained. Formation of continuous vertical joints should be avoided. 10. Vertical surfaces of the wall should be constructed perfectly in plumb. 11. The exposed joints of the masonry should be properly pointed by mortar.	1/2 M for each (any eight)
Q.2	d) ans	**Draw a neat sketch of fully paneled door in elevation for a opening size of 1200 mm x 2200 mm.**	4 M for any one Diagram



Q.3	a) Ans	**Attempt any three of the following:** **Draw a neat sketch of scaffolding for stone masonry construction work.** 	**(12)** 2 M for Diagram And 2M for labeling

Q.3	b) Ans	**Explain four defects in plastering with neat sketch.** Following are the defects in plastering: 1) **Blistering of plastered surface**: it is the defect in which small patches of plaster are swelled out from the plastered surface.  2) **Crazing:** it is the defect in which a series of hair cracks on plastered surface are formed due to improper proportion of ingredients. 3) **Cracking:** it is the defect in which cracks are developed because of following reason- a) Improper preparation of surface to be plastered. b) Structure defects c) Lack of curing d) Faulty workmanship  4) **Effloresces:** it is the defect in which the whitish crystalline substances appears on the surface due to presence of salt in plaster materials and bricks.  5) **Popping:** it is the defect in which conical holes are formed in the plastered surface due to presence of some particles which expand on setting. 6) **Flaking:** it is the defect in which very loose mass of plastered surface is formed due to poor adhesion between successive coats. 7) **Rust strains**: it is the defect in which rust strains are formed on the plastered surface done on metal laths.	1 mark for each defect

		8) **Uneven surface**: it is the defect caused by poor workmanship. 9) **Peeling:** it is the defect in which there is complete dislocation of some portion of plastered surface which forms the patches.	
Q.3	c) Ans	**Explain the types of probable cause of non-structural cracks observed in building construction along with preventive measures for any one of crack.** **Cause of cracks:** **Cause # 1. Movement Due To Creep:** Creep of a material is defined as the property due to which the material continues to deform with time under sustained stress. Creep increases with increase in water and cement, water-cement ratio, and temperature. It decreases with increase in humidity of the surrounding atmosphere and age of material at the time of loading. **Preventive Measures:** Minimum use of cement mortar . **Cause # 2. *Chemical Reactions:*** Certain chemical reactions in building materials result in appreciable increase in volume, developing internal stresses which result in outward thrust and formation of cracks. The materials involved in reaction also become weaker in strength. Sulphate attack on cement products, carbonation in cement based materials, corrosion of reinforcement in concrete and brickwork, and alkali aggregate reaction are the common chemical actions on building materials. **Preventive Measures:** Crack due to chemical reaction can be presented by using good quality of concrete and provide increase cover for RCC member **Cause # 3. Foundation Movement and Settlement of Soil:** Shear cracks occur due to large differential settlement in foundation. Building constructed on expansive soils which are susceptible to swelling on absorbing moisture and shrink on drying due to change in moisture content of the soil. These are extremely susceptible to cracking. Special measures are needed to prevent the cracks. Settlement of building built on made-up soil may occur when water due to heavy rains or floods gets into the foundation and causes settlement in the soil under load of the structure. Such settlements are generally not uniform in different parts and cause cracking. **Preventive Measures: proper Compaction of Soil to Prevent Settlement Cracks in Concrete:** The area below the concrete slab has to be compacted properly and in layers so as to ensure against settlement of soil later. If the soil is left loose it will settle over time and create cracks on surface. This applies in the home as well as constructions on highways. **Cause # 4. Cracking Due To Vegetation:** Existence of vegetation may be the cause of cracks in walls due to expansive action of roots growing under the foundation or in brick masonry. When soil under the foundation of a building happens to be shrinkable clay, cracking in walls and floors of the building may occur either due to dehydrating action of growing roots on the soil which may shrink and cause foundation settlement or due to upward thrust on portion of the building. **Preventive Measures:** Do not let trees grow too close to buildings, compound wall, etc. taking extra care if soil under the foundation happens to be shrinkable soil. If any saplings of trees start growing in fissures of wall etc remove them at the earliest opportunity. **Cause # 5. Effect of changes in Temperature** Various building materials are used for the construction of a building and all the materials have different coefficient of expansion. Due to changes in the temperature, the expansion and contraction of the	3M for cause and 1 M for preventive measure

building components takes place which result in the changes in the size and shape of the components.

Preventive Measures: Cracking due to temperature. Variation can be prevented by introducing expansion, contraction and slip joints at appropriate location. Painting top roof with reflective finish such as white wash.

Q.3 d) **Describe the procedure of water proofing used in slabs stating its importance in building construction.** — 4 M

Ans

Following is the stepwise procedure effectively applied in treatment of brick bat coba.

1 All existing treatment or coating on roof slab top is initially removed and surface is cleaned by hard wire brush and washed with water. In case of new R.CC. roof slab, its surface is broomed or cleaned properly. Note that, the surface should be free from any oil, grease, dust etc.

2. All non-structural cracks greater than 0.5 mm wide and construction joints if any, should be cut in V shape and these cutting portion in V-shape is cleaned with wire brush and washed. Then cracks are filled by polymer or modified cement or mortar using acrylic polymer. Then cement slurry mix is spread over the cleaned roof surface. Then a layer of cement sand mortar with a proportion of 1: 4 with waterproofer is laid over the 15 mm thick cement slurry already applied over the roof surface.

3. Then a layer of brick bats, soaked overnight in water are laid on the layer of cement mortar (1:4 proportion). Average thickness of the layer of brick bats is about 110 mm and it is about 70 mm near rain water pipe and 150 mm at ridge.

4. The gaps between the brick bats are generally kept in between 15 mm to 20 mm. These gaps are filled with cement mortar having proportion of 1:4 admixed with waterproofed.

5. After performing the work mentioned in step 4 curing should start next day and it should be done for 7 days Curing should be done by ponding method.

6. After the curing of 7 days, the top surface is finished smooth with 20 mm thick cement sand mortar having proportion of 1: 4 admixed with a water proofer. Curing is started from next day and continued for 14 days. It should be done by ponding method. Note that, all liquid admixtures should be mixed with water. Then this finished smooth green surface is marked with 300 mm false squares The curing is done on next day.

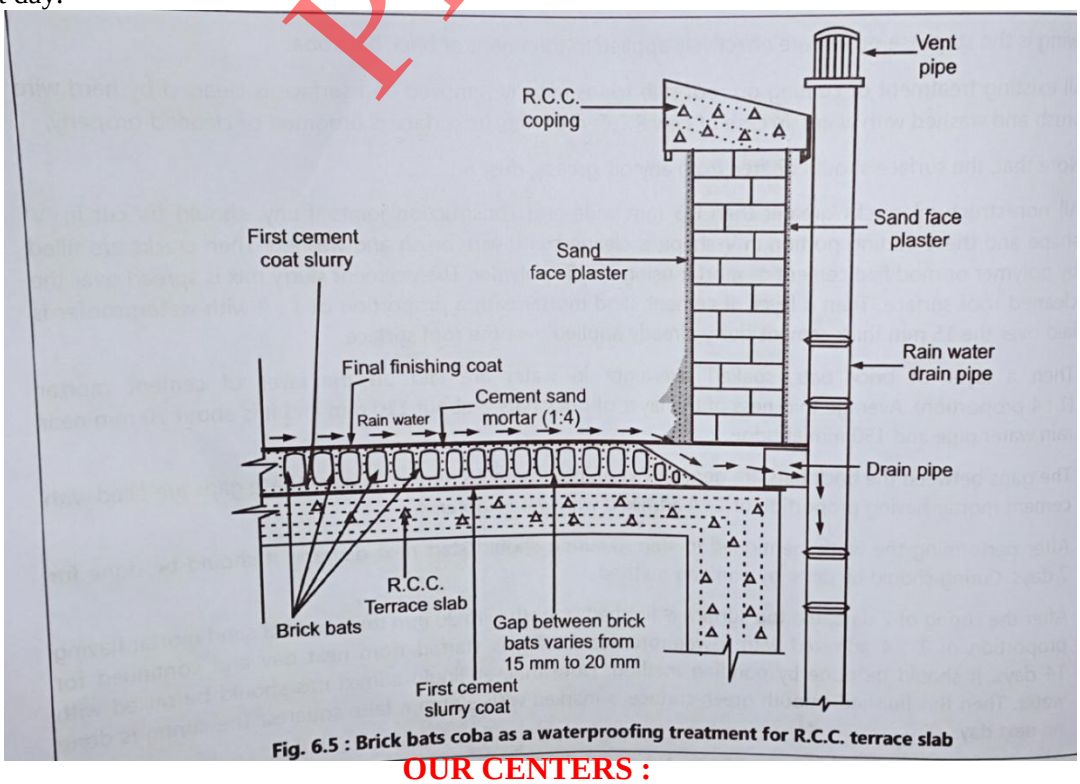


Fig. 6.5 : Brick bats coba as a waterproofing treatment for R.C.C. terrace slab

Q4		**Attempt any three of the following:**	12M
	a) Ans	**Define substructure and superstructure. Give their components also.** **Substructure: -** A part of structure lying below the ground surface is known as substructure. components of substructure :-1) foundation **Superstructure: -** A part of structure lying above the ground surface is called superstructure. Components of superstructure: 1)Plinth 2) Floor 3) Wall 4) Column's 5) Beam 6) Roof 7) Doors 8) Windows 9) Lintel 10)Sill 11) Staircase 12) Parapet.	1 M 1 M 1 M 1 M
	b) Ans	**Explain the procedure of preparation of surface along with the method of application of color wash paint on the wall.** The correct preparation of surface plays an important role in preserving the properties and life of the paint. For these the procedure is as follows: 1.If the receiving surface is rough, it should be made smooth by rubbing with sand paper. 2.The surface should be perfectly dry before applying the paint. 3.In a case of newly plastered surface, the surface is damp then it should be allowed to dry for at least one month. 4.If the walls are old, then all dirt, dust and rust should be removed from the surface. by HCL. 5.If oily materials are available on surface it should be removed by HCL. 6.All the nail hole's in the walles should be filled with morter so that the surface become smooth. 7.If the surface is having efflorescence patches they should be clean with dry cloth. 8.The surface should be thoroughly rubbed with sand paper, washed clean and allowed to dry before applying the paint. **Method of application of color wash paint on the wall.** 1.By Brushing. 2.By Spraying. 3. By Rollers**.**	4 M
	c) Ans	**Suggest precaution to be taken during demolition.** Following precaution to be taken during demolition: 1. Complete evacuation of building including pets and other animals. 2. Careful study of the building. 3. Emptying of surrounding area. 4.Preferably,surrounding and enclosing the area around building by sufficient high metallic sheeting. 5.Enough space for swinging of the wrecking ball must be ensured. 6.Proper planning of sequence of explosion. 7. Proper planning of locating explosive. 8.Action plan already prepared if explosion goes wrong or only partial explosion occur.	4M (1 Mark for each point)

d) **State any four precautions to be taken while plastering.**

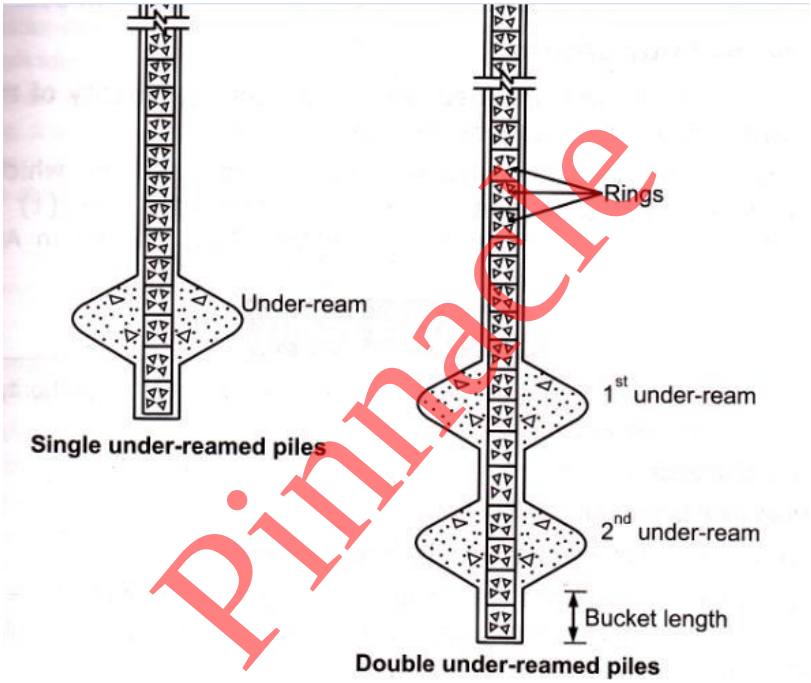
Ans **i.** Before application of the plastering, the surface must be clean and free of dirt, oil, or other elements which may interfere with bonding.
ii. Smooth or non-absorbent surfaces should be prepared.
iii. It is strongly recommended that the surfaces be dampened with clean water prior to applying the plastering for improved performance in adhesion, durability, and reduced cracking.
iv. Sand used must be sieved and washed.
v. The material used in preparation of plastering mixes must be measured by volume using gauge-boxes or by weight.
vi. Chicken mesh of 20 gauges as approved shall be used over junctions of concrete and masonry or two dissimilar materials.
vii. Raking out of joints is expected to be carried out along with masonry but it should be checked thoroughly so as to receive good key.
viii. The method of application is also important and hence it is recommended that the mix be thrown on the surface rather than stuck with trowel. This increases the adhesion.
ix. Scaffolding should be rigid, allowing free and safe movement on the platform and it should be at sufficient distance or height from the working areas. Scaffolding shall be with proper railings.
x. Corners, external or internal, shall be finished along with final coat. It is advisable to have rounded corners.
xi. Finishing of plaster may be carried out with wooden float (randhas) or trowelled smooth with sheet metal trowels as specified. Care shall be taken to avoid excessive trowelling and overworking of the wooden float.
xii. Plaster shall be cut to correct horizontal or vertical line at the end of the day or if work requires to be suspended for any reason.

4M
(1 mark for each point)

E) **Differentiate between brick masonry and stone masonry**

Sr. no.	Brick masonry	Stone masonry
1.	It is cheaper than stone masonry	It is stronger than Brick masonry
2	It is cheaper in places where clay is available	It is cheaper in places where stone is available in abundance
3	Brick masonry gives less aesthetic view.	Stone masonry gives more aesthetic view than brickwork.
4	Brick masonry offer better fire resistance than stone	Stone masonry offers less fire resistance
5	Mortar joint in brick work are less	Mortar joint in stone work are more
6	Bricks are uniform in size so much skill is not required for proper bond	The size of stone is not uniform therefore greater care and skill is required
7	Plastering increases the life of brick from decaying.	Plaster does not stick nicely to a stone surface. It is difficult to apply any finishing to the stone surface
8	Brick masonry is light weight.	Stone masonry is heavier
9	It is easy to apply any finishing to Brick surface.	It is difficult to apply any finishing to stone surface

4 M
(1/2 mark for each point)

Q 5	a)	**Attempt any TWO of the following:** **Suggest relevant type of foundation with sketch for educational building on black cotton soil with justification.**	12 m
	Ans	**Black cotton soil-** Pile foundation. In case the depth of black cotton soil is more, the following type of foundation may be provided 1. Strip or pad foundation 2. Pier foundation with arches and 3. Under reamed pile foundation Under-reamed piles are best solution for foundation problem in black cotton soil or such similar type of expansive soil. They are bored cast-in-situ concrete piles having bulb shaped enlarged base.  	3 m 3 m (for diagram)
	b)	**Define shoring. Enlist types of shoring. Explain any one type with neat sketch.**	
	Ans	Shoring:- Shoring is the construction of a temporary structure to support temporarily an unsafe structure. These support walls laterally. Shoring can be used when walls bulge out, when walls crack due to unequal settlement of foundation and repairs are to be carried out to the cracked wall, when an adjacent structure needs pulling down, when openings are to be made in newly or enlarged in a wall. Types of shoring 1.Raking shore 2.Flying shore 3.Dead shore	2 M 2 M

1. Raking Shoring

In this method, inclined members known as rakers are used to give lateral supports to walls. A raking shore consists of the following components:

1.Rakers or inclined member
2.Wall plate
3.Needles
4.Cleats
5.Bracing
6.Sole plate

2 m for any one explaination

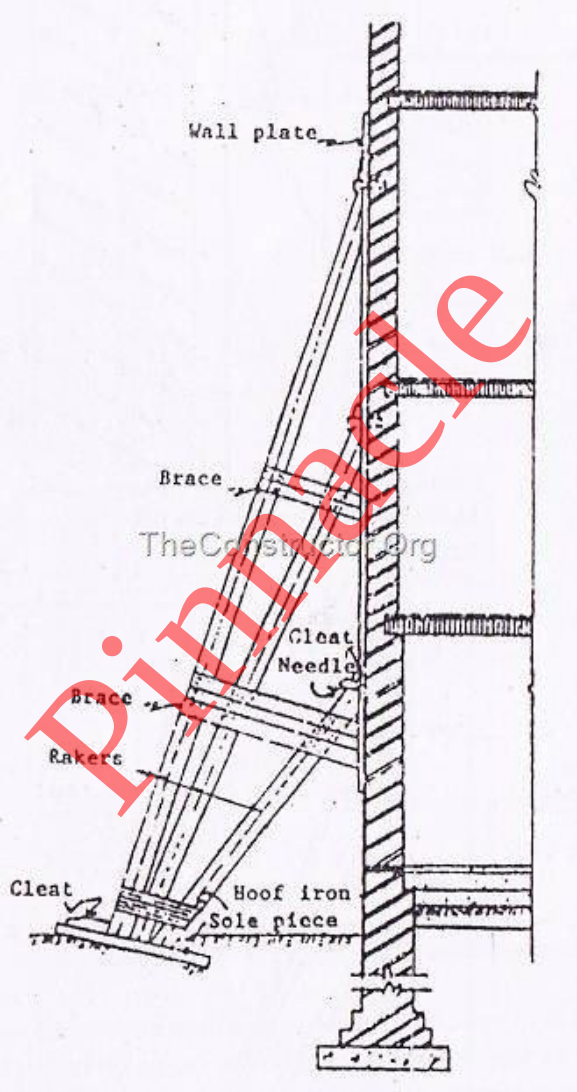


Fig.1: Raking Shores Wall Support

2. Flying Shoring

Flying shores is a system of providing temporary supports to the partly walls of the two buildings where the intermediate building is to be pulled down and rebuilt . All types of arrangements of supporting the unsafe structure in which the shores do not reach the ground come under this category.

The flying shore consists of wall plates, needles, cleats, horizontal struts (commonly known as horizontal shores) and inclined struts arranged in different forms which varies with the

situation. In this system also the wall plates are placed against the wall and secured to it.
A horizontal strut is placed between the wall plates and is supported by a system of needle and cleats. The inclined struts are supported by the needle at their top and by straining pieces at their feet. The straining piece is also known as straining sill and is spiked to the horizontal shore. The width of straining piece is the same as that of the strut.
When the distance between the walls (to be strutted apart) is considerable, a horizontal shore can not be safe and a trussed framework of members is necessary to perform the function of flying shore.

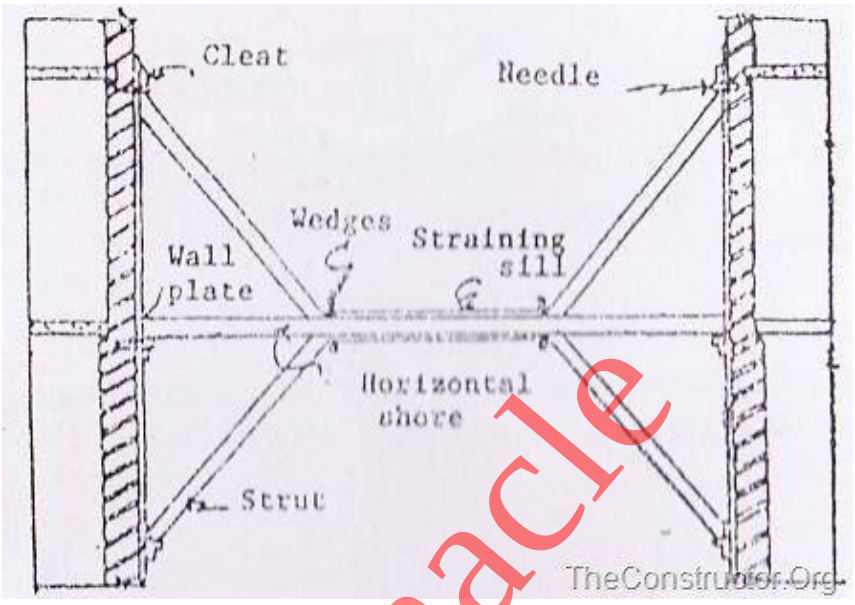


Fig.2: Flying Shore

3. Dead Shore OR Vertical Shore

Dead shore is the system of shoring which is used to render vertical support to walls and roofs, floors, etc when the lower part of a wall has been removed for the purpose of providing an opening in the wall or to rebuild a defective load bearing wall in a structure.The dead shore consists of an arrangement of beams and posts which are required to support the weight of the structure above and transfer same to the ground on firm foundation below.

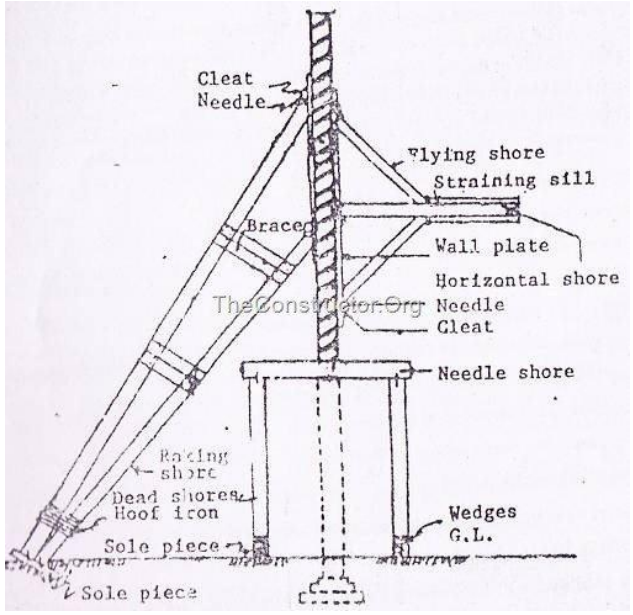
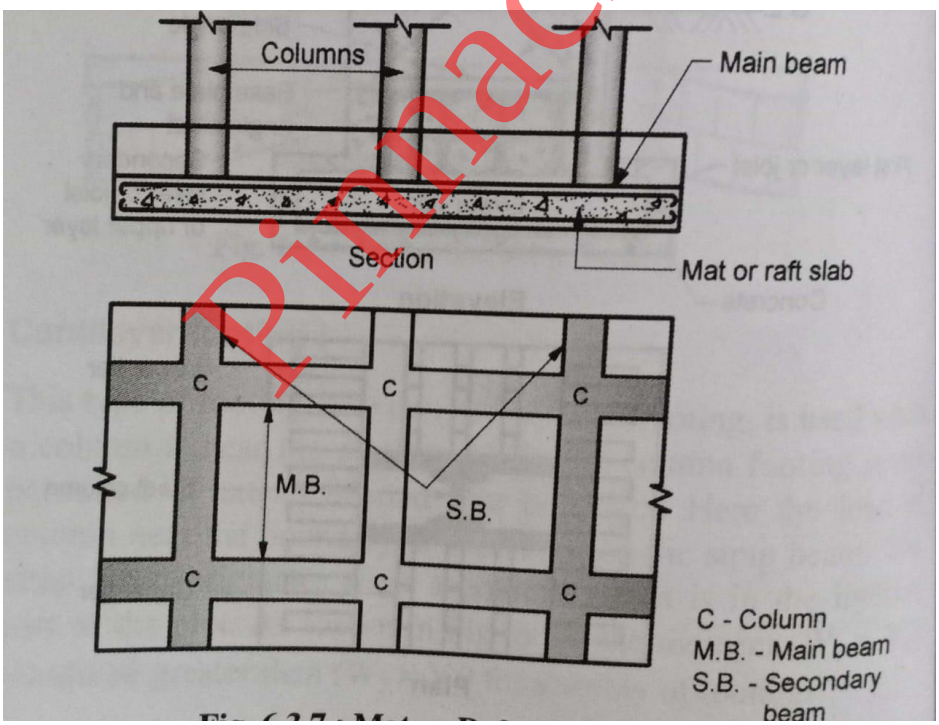


Fig.3: Dead Shore

	c)	**Suggest suitable type of window for the following buildings:** 1.Cinema hall – Fixed window 2. School- Metal window / Sliding window 3.Enlosed staircase- Fixed window / Metal window 4.Bathroom- Louvered window 5.Cement godown- Fixed window 6.Sloping roof-Dormer window	6M (1 m for each)
Q6		**Attempt any TWO of the following:**	12 M
	a) Ans	**Explain raft foundation with neat sketch and explain its suitability.** **Raft Footing:** 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  **Mat or Raft Foundation**	2 m 4 m
	b)	**Explain the requirements of good formwork with names and materials proposed for beam of**	

size 300 X 450 mm with neat labeled sketch.

Ans

Requirements of good formwork:-

1. It should be adequately strong to withstand an extensive variety of dead and live loads. For instance, self-weight, weight of reinforcement, weight of wet concrete, loads of workers, and any other loads during and after casting of concrete.
2. It should be inflexibly built and efficiently propped and supported to hold its shape without undue deflection.
3. The joints in the formwork should be tight enough to prevent leakage of cement grout.
4. The formwork should be created in such a way that it may allow the evacuation of different parts in the desired sequence without shaking or damaging the concrete.
5. The material of the formwork should be inexpensive, easily accessible and can be reused for several times.
6. The surface of the formwork should be plain and smooth, and set properly to the desired line and level.
7. The material of the formwork should not bend or get perverted in presence of sun, rain or water at the time of concreting.
8. It should be lightweight.
9. It should be easy to remove.

4 m (1 m for each point)

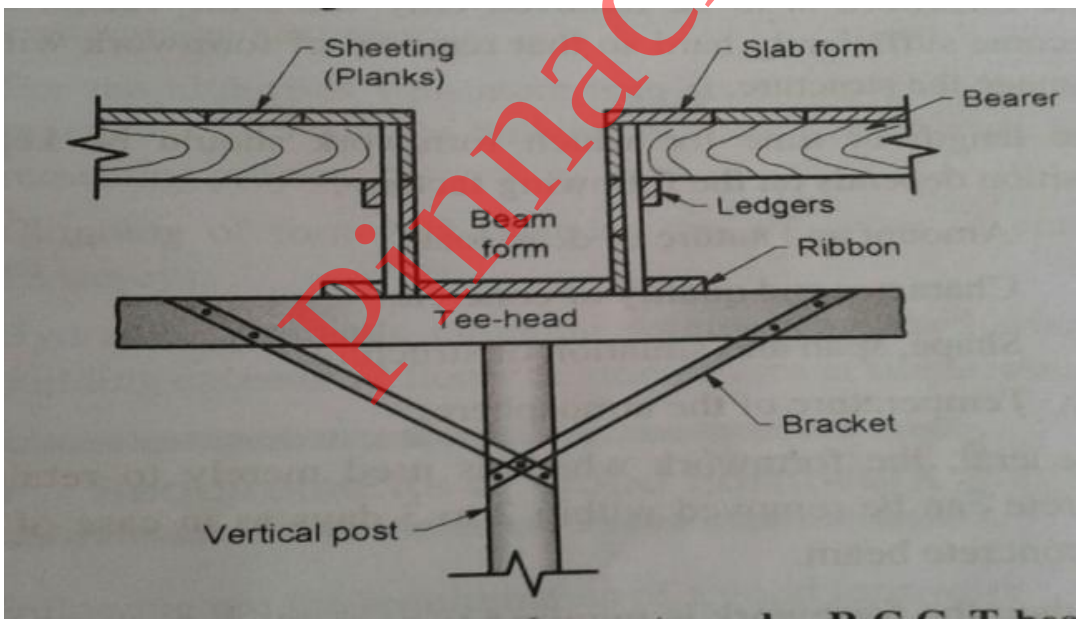
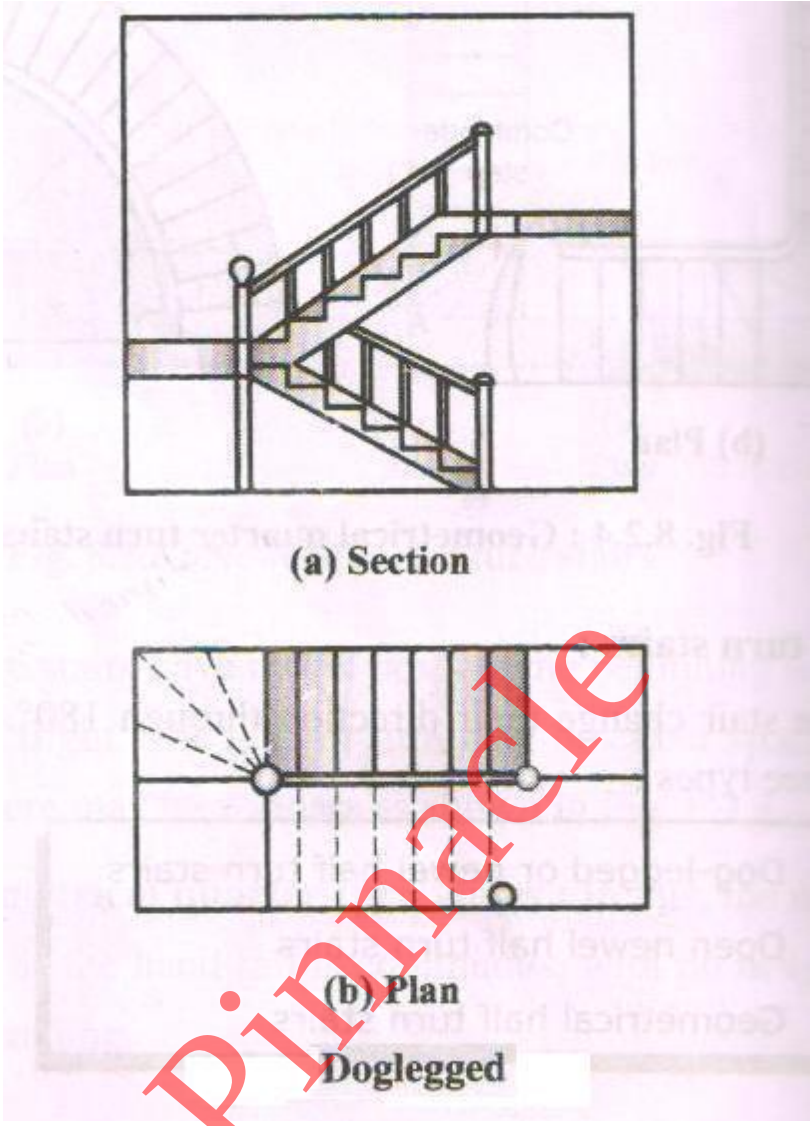


Fig. showing form work for beam

2 m for diagram

	c) Ans	**Draw plan and elevation of dog-legged staircase for floor to floor height of 3.0 m**  **(a) Section** **(b) Plan** **Doglegged**	3M 3M