MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION

(Autonomous)

(ISO/IEC-270001 – 2005 certified)

SUMMER-14 EXAMINATION

Subject code: 17308 **Model Answer** **Page No: 1/ 16**

Important Instructions to examiners:

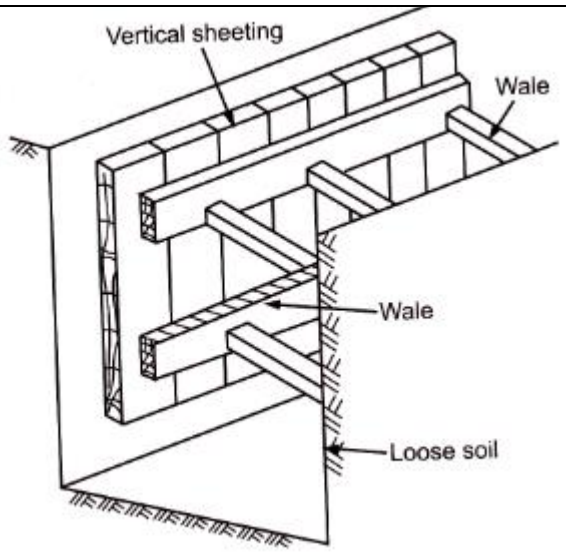
1) The answer should be examined by keywords and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language error such as grammatical, spelling errors should not be given more importance. (Not applicable for subject English and communication skill).
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 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.

Q.1 a)Attempt any SIX of the following :	**12**
i) Define foundation.	
The lowest artificial part of the structures which is in direct contact with the ground and which transmit the loads of the construction to the ground is known as foundation.	02
ii) Enlist the four tools & plants used for stone masonary.	
Tools & plants used for stone masonary: 1)Speed ii)Kassi or phawrah iii)Iron pan iv)pick axe v)Line and pins vi)Sledge hammer vii)Rammer viii)Auto square ix)Punch x)Gad xi)Scrabbling xii)Hammer xiii)Spall hammer **.*(½ marks each any four)**	*
iii)State the function of the arch.	

<table>
<tr><td colspan="2">The main function the arch to carry the weight of the structure above the opening & to transfer the load to supporting pier or wall.</td><td>02</td></tr>
<tr><td colspan="2">iv) Define the term ‘Newel Post ’with reference to stairs.</td><td></td></tr>
<tr><td colspan="2">These are the principal post supporting to a hand rail .Newel are used at the beginning and end of the balustrade.</td><td>02</td></tr>
<tr><td colspan="2">v)Enlist any four types of stairs.</td><td></td></tr>
<tr><td colspan="2">i)Straight stairs ii)Dog legged stairs iii)Open level stairs iv)Geometrical stairs v)Circular stairs vi)Bifurcated stairs *(½ marks each any four).</td><td>*</td></tr>
<tr><td colspan="2">vi) Write any two object of pointing.</td><td></td></tr>
<tr><td colspan="2">i)It is the art of finishing mortar joints in the exposed masonry or lime mortar to protect the joints form whether effect .
ii)It improve the appearance of building structures .
iii)Pointing is cheaper method of protecting the joints.
iv)The joints face of the stones or brick masonry.</td><td>1 marks each (any two)</td></tr>
<tr><td colspan="2">vii) What are the various types of the cracks?</td><td></td></tr>
<tr><td colspan="2">i)Surface cracks and deep cracks ii)Horizontal vertical and diagonal cracks iii)Straight cracks and branching cracks *(1 marks each any two).</td><td>*</td></tr>
<tr><td colspan="2">Viii) Define ‘Prestressed concretes’.</td><td></td></tr>
<tr><td colspan="2">Prestressed concretes are that concerts in which compressive stresses are induced in the concrete section before the member is located by external loads.</td><td>02</td></tr>
<tr><td colspan="2">b)Attempt any TWO of the following :</td><td>08</td></tr>
<tr><td colspan="2">i) Differentiate between load bearing structure and framed structure.</td><td></td></tr>
<tr><td colspan="2"><table>
<tr><td>Load Bearing structure</td><td>Framed structure.</td></tr>
<tr><td>1)It is suitable when hard strata are available are shallow depth.</td><td>It is suitable for any type of soil.</td></tr>
<tr><td>2)In the structures the load is carried by the wall</td><td>In the structure load is carried by beam column and footing .</td></tr>
<tr><td>3)The thickness of wall is more</td><td>The thickness of wall is less.</td></tr>
<tr><td>4)Floor area is less</td><td>Floor area is more.</td></tr>
<tr><td>5) It is suitable for one storeys.</td><td>It is suitable for number of story’s.</td></tr>
<tr><td>6)It require more time of construction</td><td>It require more time of construction</td></tr>
</table></td><td>1 marks each (any four)</td></tr>
</table>

7)It can not resist are earth quick vibration.	It can resist are earth quick vibration.	
8)It having more maintenance cost .	It having more maintenance cost.	
ii)Enlist any eight precaution which are required to be taken while marking layout on ground for a structure.		
1)Correct measurement of distance preferably by steel tape. 2)Correct fixing of plot boundaries with the help of location sketches. 3)Use of level either dumpy level or mason's level. 4)Correct marking of face-line or center line. 5)checking the distances from at least two independent measurements. 6)Diagonal checks for individual room position as well as for complete building. 7)Use of correct plumb bob for transferring points on ground. 8)Meticulous care in all types of measurement.		½ mark each (any eight)
iii)What are the various methods to dewater deep excavation ? Explain any one.		
1)Dewatering by ditches and sumps 2) Dewatering by well point system 3) Dewatering By pumping methods 4) Dewatering by deep well system 5)Vacuum methods. **Vacuum methods-** In this Method a hole of 30 cm diameter is boared around the well point and arise pipe It is then sealed using betonies soil cement or play the header pipe is then connected to vacuum pump for removal of water . ***(2 marks for list of methods & 02 marks for explanation)**		*
Q.2 Attempt any FOUR of the following :		16
a)Enlist various building component of superstructure .Explain any one.		
The building component of superstructure are as follows. 1) Foundations 2)Plinth3)Walls 4)columns 5)Floor 6)Door and windows & Ventilators 7)Stairs and lifts 8) Roofs 9)Building finishes 10) Building services 11)Lintels & Arches, etc **Foundation** :- Lowest part of the structure below the ground level. It transmits the load of the structure to the soil. Foundations may be of various types depending upon the type of structure. **OR** **Plinth:--** The projecting part of the wall above the ground the level to the floor level is the plinth It is capped by beam called plinth beam. The provision of plinth beam and dam proof course		*

at plinth level are very important in building construction. The plinth is at least 0.45m above the ground level of the building. **OR** **Walls** :- These are provided to enclose or divide floor space in desired pattern. Walls provide privacy, security & protection against sun ,wind, rain, etc. ***1/2 marks of each component .Attempt any four Explanation 02 marks***	
b)What are the general principal of earth queak resistant structure while planning ?	
General principal is quick resistant structure while planning is given below- 1)Lightness: The building light as possible consistent with structural safety 2)Continuity of construction :The part of building should be tied together in such manner that the building act as a one unit. 3)Projecting and suspended part: Projecting part shall be avoided as far as possible. 4)Building configuration: The building should have a simple rectangular plan and be symmetrical both with respect to mass and rigidity so that center mass of rigidity of the building coincide with each other in which case no separation section other than expansion joints are necessary. 5)Straight in various direction: The structure shall be designed to have adequate strength against earthquake effect along the both the horizontal axes. 6)Foundation: The structural shall not be founded on loose soil. 7)Ductility: Providing reinforcing steel in masonry it increase the straight and stability. 8)Fire safety: Building shall be constructed in make them fire resistance.	01 marks each (any four)
c)Explain timbering and strutting for foundation trench.	
When the subsoil is loose timbering and strutting method is used to given temporary support to the sides of strange. There are different method of timbering and strutting a)Box sheeting b)Stay bracing c)Runner system d)Vertical Sheeting e)Sheet Piling. **Box Sheeting –** If the depth of excavation is up to 4 meter and if the soil is loose the box sheet method is commonly it is shown in the fig.	02 *



OR

Stay bracing :- This arrangement of preventing the slip of earth in foundation trenches is used when the excavation is to be carried out in moderately firm ground and the death of excavation does not exceed 2 metres.

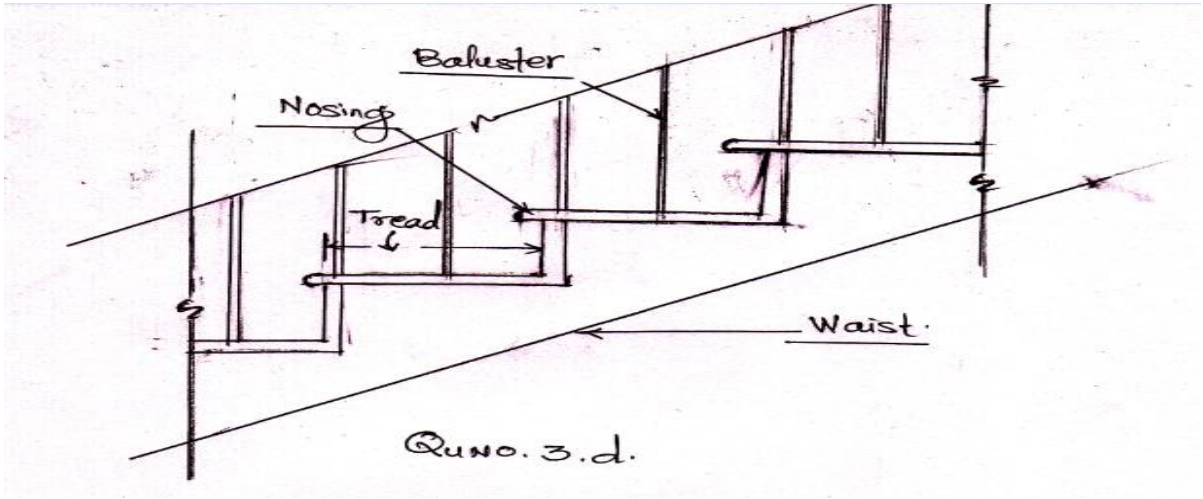
OR

Sheet piling:- This arrangement of preventing the slip of earth in foundation trenches is adopted when a) large area is to be excavated for depth greater than 10 metres b) soil is to be excavated is loose c) width of trench is large

(02 marks for explanation of any one type)

d)What are requirement of good foundation ?	
1)The foundation shall be constructed to sustain the dead and imposed loads and to transmit to the sub soil in such a way that it will not cause settlement.	1
2)The foundation structure should be stable and safe against any possible failure .	1
3)Foundation should be taken sufficiently deep to guard the building against damage or distress caused by swelling or shrinkage of the sub soil.	1
4)Foundations should be so located that its performance may not be affected due to any unexpected future influence.	1
e) Enlist any four precautions to be taken while constructing foundation in block cotton soil.	
1) With depth of black cotton soil less than 1.5 meter then entire soil may be removed. 2) Use under reamed pile for foundation in black cotton soil. 3) For important structure raft foundation should be provided.	*

4) The load on the soil should not exceeds 5.5 tonnes / m^2 . To provide reinforced concrete ties all-around of the main wall around the buildings. 5) To break the direct contract between and masonry. ***(1 marks for each .Attempt any four)***	
f) Enlist any four terms used in stone masonry .Explain any one.	
1)Natural bed 2)sill 3)corbel 4)Course 5)Cornice 6)Coping 7)Weathering 8)Throating 9)Plinth 10)String Corse 11)Lacing Corse 12)Spalls 13)Quoins 14)Bond 15)Through stone 16)Jambs 17)Reveals 18)Heads 19)Apex 20)Backing 21)Hearting . **Through stones** –In stone work some stones at regular interval are placed right across the wall. such stones are known as through stones. The area coved by the through stones should be about ¼ to ½ of the area of the wall surface .The through stones should be non-porous and having sufficient thickness .It must connect facing & backing of wall. Generally length of through stone is equal to the width of wall, Sometimes two stones with overlap are provided. ***(½ marks each any four Explanation 02 marks)***	*
Q.3)Attempt any FOUR of the following :	16
a) Which type of masonry will you suggest for pitching of earthen dam? Why?	
For pitching of earthen dam rubble masonry is suitable. Because in this masonry no mortar is used and this kind of construction is cheapest. In this type of construction just by inter locking of stones, the stability of masonry is achieved.	04
b) Enlist various type of doors. Explain any one	
b)Various types of doors are i) Framed &Paneled doors ii) Battened & Ledged doors iii) Ledged & Braced doors iv) Flush doors iv) Glazed or sash doors v) Collapsible doors vi) Revolving doors vii) Rolling shutters viii) Louvered doors ix) Sliding doors. **Framed &Paneled doors** :_ This type of door is commonly provided in all types of buildings .It consists of framework of styles & rails. The door may be single ,double, three panel or four paneled etc **OR** **Battened & Ledged doors** :- Simplest door & commonly used for narrow opening. It consists of usually a series of vertical battens tounged & grooved & fixed together with	02 *

horizontal battens known as ledgers, ***(2 marks for explanation any one type)***	
c) Give the reasons to justify the following statements i) Normally bottom rails are made wider than rails ii) In ledged and breed doors, the brasses are made to incline upwards from the hanging edge	
i) Normally bottom rails are made wider than rails because to provide the support to panels of doors and to increase strength of door it is necessary. Lock rails are made wider than top rails because various types of looking accessories are to be fixed on this rail and handle of doors is also fixed on this rails. ii) In ledged and breed doors, the brasses are made to incline upwards from the hanging edge because to balance the door this is necessary on hinged end. One can provide hinges to take the load.	02 02
d) Sketch neatly large view of stair to show of the following 1) Nosing 2) Baluster 3) Waist 4) Tread	
	02 mark fig, 02 mark labels
e) State any four types of floors. Explain any one.	
i) Brick flooring ii) Mud flooring iii) Murum flooring iv) Cement concrete flooring v) Flag stone flooring vi) Terrazzo flooring vii) Mosaic flooring viii) Marble flooring ix) Granite flooring x) Timber flooring	02 Mark for types

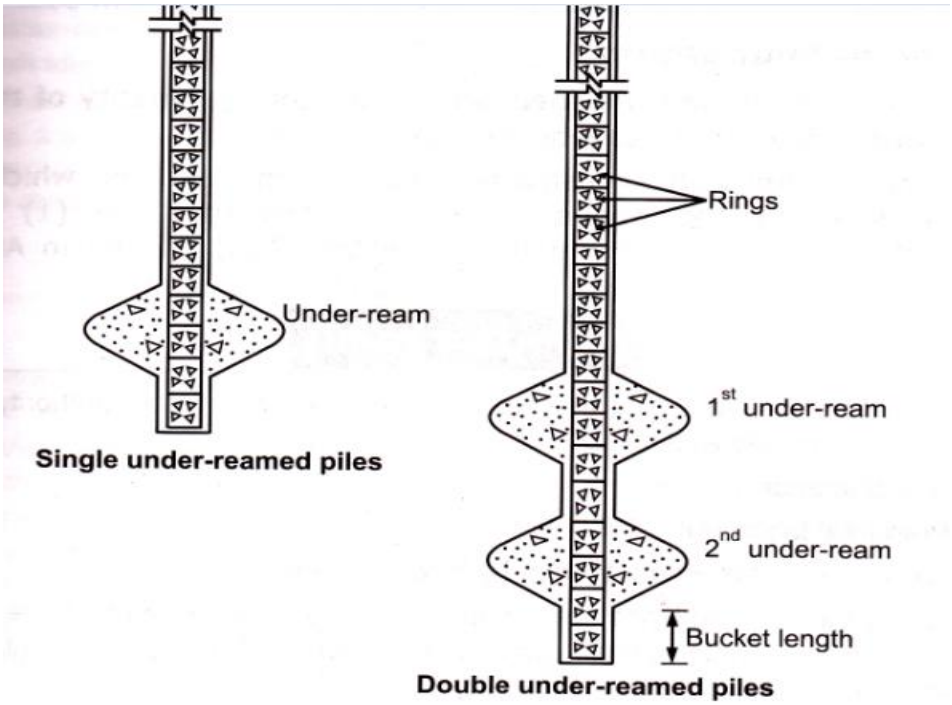
Brick flooring :- It is provided for warehouses, stores & godowns or places where heavy articles are stored. The flooring may be done with brick laid flat or on edge on 12mm thick mortar bed.The flooring should be cured for minimum period of seven days before use. **OR** **Mud flooring:-** These are constructed in villages. They are cheap ,hard, fairly impervious, easy in construction & maintenance. They remain warm in winter & cold in summer hence suitable under adverse conditions of climate *(. ***explanation of any one of above list 2 marks)***	*
f) Differentiate between pitched roof and flat roof.	
Pitched Roof / Flat roof	
1) It is inclined in nature. / 1) It is horizontal in nature. .	1
2) It is light in weight / 2) It is heavy in weight.	1
3) It is suitable for short span. / 3) It is suitable for long span.	1
4) It is suitable for single storeyed building / 4) It is suitable for multi storeyed building..	1
Q.4) Attempt any FOUR of the following :	16
a)Give the reasons for the following: i)The wooden floor is provided in the auditoriums. ii)For multi storeyed building the flat roof is the only choice.	
i)The wooden floor is provided in the auditoriums. In auditorium sound absorption is necessary. It prevents the reverberation and formation of echo. The wooden floor is the most suitable sound absorbent material. Hence the wooden floor is provided in auditoriums.	02
ii)For multi storeyed building the flat roof is the only choice. In case of multi storeyed building the number of floors are more. Flat roof is horizontal and generally R.C.C. slab is provided on flat roof and we can construct next floor on it. Pitched roof is inclined and suitable only for ground floor. Hence for multi storeyed building a flat roof is the only choice.	02
b)Describe the procedure for carrying out the plaster in cement mortar in two coats	
i) Well rack the surface of wall and clean of all loose dust. ii) Well water the surface of wall or other structure. iii) Prepare the cement mortar as per the proportion and dash against the surface. iv) Well level the surface of mortar with the help of float and straight edge and finally	

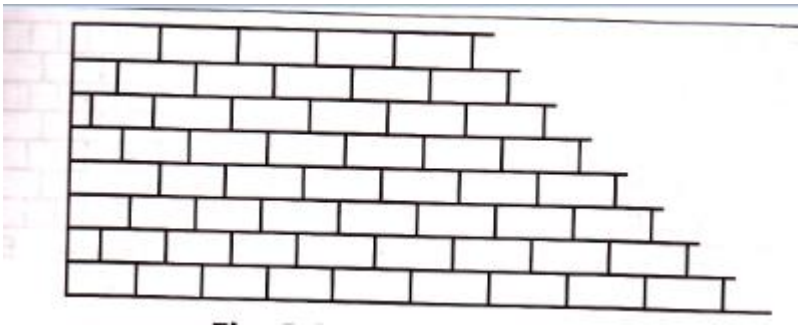
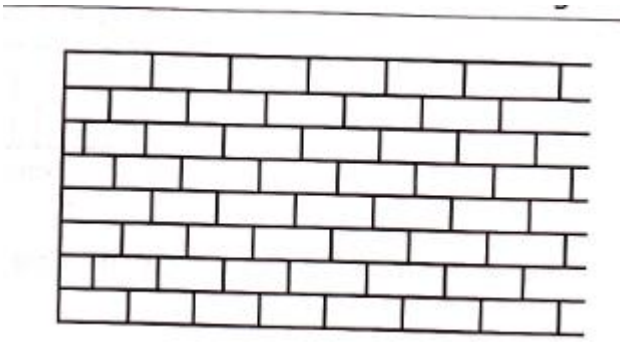
finish the trowels. v) Roughen the surface of first coat with help of scratching tool to provide the key to the second coat. vi) Second coat to the plaster is applied after 2 days. vii) Prepare the cement mortar with cement and very fine sand in proportion 1:2 and dash against the first coat. viii) Well level the surface of mortar with the help of float and straight edge and finally finish with trowels.	½ Mark for each step
c)Enlist any four types of pointing. Explain any one	
i) Flush pointing ii) Cut or weathered or struck pointing iii) Receded pointing iv) Keyed or rubbed or grooved pointing. v) Tuck pointing vi) Vee pointing vii) Beaded pointing. **Flush pointing :-**In this type the mortar is pressed into the raked joints and finished off flush with the edges of the bricks or stones so as to give smooth appearance. This is the simplest type & extensively used for brickwork & stone masonry face work. **OR** **Cut or weathered or struck pointing:-** In this type the mortar is first pressed into the raked joints. While the morter is still green, 5he top of the horizontal joint is neatly pressed back by 3 to 6 mm with the pointing tool. ***(explanation of any one of above list 2 marks)***	02 *
d) Which type of paint is suitable for exposed rough surface? Why?	
For exposed rough surfaces cement based paint is suitable because on drying it forms a decorative ,strong, durable and water resistant film on surface. It protects the exposed surfaces from action of weather such as rain, sun rays etc.	02 02
e) What are the requirements of a good form work?	
i) It should be strong enough to withstand all types of dead and live loads. ii) It should be rigidly constructed and efficiently propped and braced iii) The joints in the formwork should be tight against leakage of cement grout	

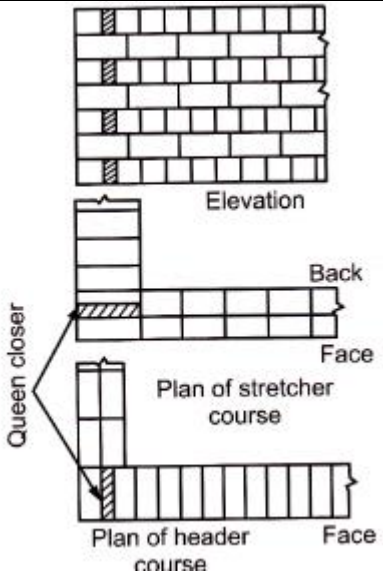
iv)	It should be easy to remove the various parts without damaging the concrete.	
v)	The material of the formwork should be cheap and easily available and it should be suitable for reuse for several times.	½
vi)	It should be set accurately to the desired line and level.	Mark
vii)	It should be as light as possible.	each
viii)	The formwork should rest on firm base.	
f)Describe the procedure for water proofing of sanitary block after construction.		
i)	All existing treatment or coating on roof slab top is initially removed and surface is cleaned by hard wire brush. And washed with water.	
ii)	All non- structural cracks greater than 0.5 mm wide should be cut in 'V' shape. Then the cracks are filled with polymer or modified cement or mortar using acrylic polymer.	
iii)	Cement slurry mix is spread over the cleaned roof surface.	½
iv)	The Layer of cement sand mortar with a proportion of 1:4 with water proofer is laid over the layer of slurry.	Mark for
v)	The layer of brick bats, soaked overnight in water are laid on the layer of cement mortar	each
vi)	The gaps between the brick bats are generally 15mm are filled with cement mortar(1:4) admixed with water proofer.	
vii)	Curing by ponding method is started from next day and continued for 7 days.	
viii)	After seven days curing the top surface is finished smooth with 20 mm thick cement sand mortar in proportion 1:4and admixed with water proofer. Curing is started from next day and continued for 14 days. It should be done by ponding method.	
Q.5. Attempt any FOUR of the following.		16
a) How will you prevent subterranean termites?		
Prevention of subterranean termites:- a special treatment should be given . To overcome this difficulties raised because of termites, some of the termite materials are available in the market in the different trade names are 1) DDT 2) BHC 3) Aldrin 4) Heptaclor 5) Clordane. With the help of termite materials, growth of termites can totally be stopped and hence one can protect the wood made articles and foundation of the building. If there is growth termites in the soil beneath the building and around the foundation. Then		04

holes are made around the building, and termite-proof chemicals are put in to that holes.	
b)What are the various methods of prestressing the concrete? Explain any one.	
Methods of prestressing:- 1) Externally and internally prestressed members. 2) Linear or Circular prestressing 3) Pre-tensioning and Post-tensioning Explanation of any one method. **1) Externally and internally prestressed members.:-**A member can be prestressed either by external reaction offered by rigid abutments or by tensioned tendon. The former method is called external prestressing and the latter method is called internal prestressing. **OR** **2) Linear or Circular prestressing:-** The term circular prestressing is applied to prestressing circular structures like tanks, silos and pipes. In this case, the tendons are provided in the form of rings. Linear prestressing is the term applied to prestressing straight members like beams and slabs. **OR** **3) Pre-tensioning and Post-tensioning:-** In pre-tensioned members, the tendons are tensioned even before casting the concrete and in post-tensioned members, the tendons are tensioned even after casting the concrete	02 02
c) State any four types of shallow foundation. Explain any one.	
Types of shallow foundation:- 1) Stepped foundation a) Wall footing b) Reinforced concrete footing c) Column footing i) Isolated, ii) Combined, iii) Raft Foundation. **Column footing** i) Isolated:- It is provided under a column or other similar member for the distribution of concentrated load in the form of uniformly distributed load on the soil below. The shape may be square, rectangular or circular in plan. It may be constructed either in brick masonry, stone masonry , R. C. C. or Steel grillage etc. **OR** **Raft foundation**:- In made up ground , soft clay or marshy sites having low value of bearing capacity, heavy concentrated structural loads are generally supported by providing raft foundations. Raft foundations consists of thin reinforced conc slabs . ***(2 marks for explanation of any one type above)***	02 *

d) What are the advantages and disadvantages of ready-mix-concrete?	
Advantages of ready-mix-concrete:- 1) Procurement of cement in bulk quantities works economical reduces wastage and pilferage. 2) Best quality control at negligible cost. 3) There is no long duration of storage for cement. 4) Saving in cement upto 5 to 10 % 5) Similarly in aggregate storage, handling losses of 15 to 25 % can be saved. 6) Proper quality control. 7) Quantity and quality of water required is well controlled. **Disadvantages of ready-mix-concrete:-** 1) Quantity of concrete to be produced should be substantial. 2) It needs continuity of work. 3) In case of power failure alternate diesel generating power should be kept ready as a standby. 4) In case of rains, with moisture aggregates swell, requiring immediate changes in mix design, otherwise system give wrong result. And so on.	2 marks (any four) 2 marks (any four)
e) Explain meaning and application of tremix concreting.	
Tremix concreting:- One solution to the problem of combining a sufficient high workable with a minimum W/C ratio is offered by vaccum processing of freshly placed concrete. **Application of tremixconcreting.:-**1) parking decks. 2) Industrial flooring. 3) Bridges. 4) Footpaths 5) Warehouse & Godown floors	02 02
f) Explain the application of roller compacted concrete and high impact resisting concrete.	
Application of roller compacted concrete:- 1) Dam construction 2) Roller compacted concrete pavements. **Application of high impact resisting concrete.:-** Construction of	02

1) runways. 2) railway platforms. 3) dock yards. 4) Industrial floors. 5) Parking places.	02
Q.6. Attempt any TWO of the following.	16
a) Explain under-reamed piles with respect to meaning , sketch, advantages and disadvantages	
Under-reamed piles:- 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.  **Advantages of under-reamed piles:-** 1) Used in black cotton soil. 2) Used in made up grounds and water logged area. 3) By increasing the diameter and length of the pile ,increases bearing capacity of pile. **Disadvantages of under-reamed piles:-** 1) High construction cost. 2) Skilled workers required for construction. 3) Skilled supervision required	02 02 02 02

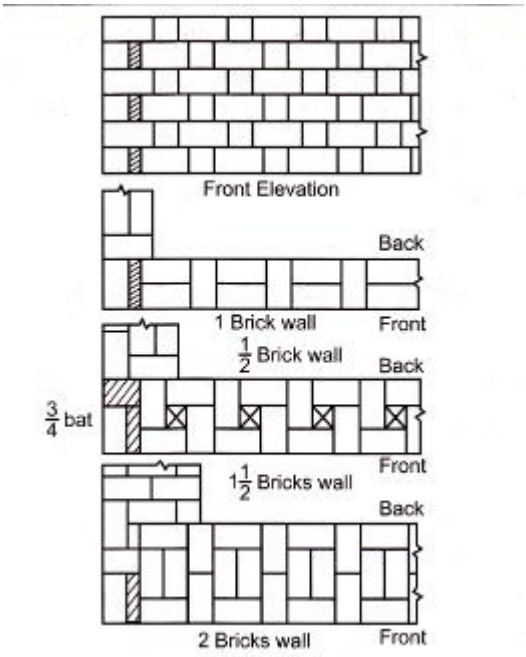
b) Explain any four types of bonds in brickwork with neat sketch.	
Types of bonds in brickwork:- 1) stretcher bond 2) Header bond 3) English bond 4) Flemish bond 5) Brick on edge bond For ex. 1) **stretcher bond**:- It consists of all bricks laid as stretches on every course with the courses laid half bond to each other, this effected in a plain wall with stopped ends by introducing a half bat as the starting brick to alternate course. The stretcher bond is useful for one brick partition wall as there are no header in such wall.  2) **Header bond**:- This type of bond all bricks are arranged in header course. The bond formed by three quarter bats at the quoin is generally used in footing courses.  3) **English bond**:- This type of bond has alternate course of headers and stretchers with a closer placed next to the quoin header to form the lap. There is, however, a variation where a closer is not used in the header course and lap is formed by starting each stretcher course with a three quarter bat.	01 01 01 01 01



01

4) **Flemish bond**:- This type of bond consists of alternate header and stretcher with the headers in one course being placed centrally in the course below. A closer is placed next to quoin header to form the lap.

01



01

c) Explain prefabricated construction with respect to meaning, types, advantages and disadvantages.

Prefabricated construction:-

02

There is trend of designing majority of buildings, consisting of parts and components

manufactured with a high degree of prefabrication at mechanized plants. The partial prefabrication units required technological effectiveness in design and utilization of prefab components and their joints involving use of minimum amount of material and manpower for their manufacture and erection. **Types of prefabricated construction:-** 1) Plant prefabrication. 2) site prefabrication. a) Job production, b) batch production, c) Flow line production. **Advantages of prefabricated construction:-** 1) Minimizes erection time. 2) High quality of individual elements. 3) better surface finish and appearance. 4) Do not require formwork. 5) labour on site greatly reduced. 6) Greater capability for good quality assurance for individual unit. And so on **Disadvantagesof prefabricated construction:-** 1) Design needs to be complete before casting commences. 2) Last minute alteration to the structures are impossible. 3) It is costlier than in-situ work specially for small scale works. 4) Unsuitable if structural alteration might be needed in the future. And so on	02 2 marks (any four) 2 marks (any four)