1. a)(i) A natural foundation is that part of the sub-soil on which the structure rests while an artificial foundation is that part of the structure which transmits the load to the natural foundation.

ii) - It should be strong

- It should be stable

- It should be resistant to chemical attack

iii) - Load being transmitted   
 - Bearing capacity of the sub soil under the proposed foundation

iv) - Deformation of the soil due to improved loads

- Volume changes of the soil as a result of seasonal conditions.

b)(i) Short-bored pile

Diagram

ii) Raft

Diagram

c)(i) Back fill

These are materials excavated from site and if suitable, used to fill in around the walls.

(ii) Ultimate bearing capacity

This is the maximum safe load per unit area that the ground can carry.

(iii) Bearing pressure

This is the amount of force the structure exerts on the ground per unit area.

d. (i) - Laying concrete pavings around the building

- Deepening the edge beam

- Laying a field drain in a trench filled with a suitable fill.

(ii) - Mining and other subsidence areas – Raft foundation

- Soft silt clays and made ground – wide strip foundation

e) (i) To protect the operatives while working in the excavations

(ii) Dry loose soil

Diagram

(iii) Firm soils

Diagram

2. a) (i) Alintel supports the imposed load by the root and the wall above a space e.g door-space- or window space etc

Diagram

(ii) - Cement

- Steal beam

- Stones

b) Haunch

(i) Haunch

Lower halt of the arch between the crown and the skew back

(ii) extrado

This is the external curve of the arch

(iii) Springing point

The point at the interaction between the skewback and intrados.

(iv) Vousoirs

The wedge shape/blocks of stones that comprise the arch.

(v) Skew back

These are inclined/splayed surface of the abutment receive the arch and from which the arch springs.

(vi) Soffit

This is the inner or under surface of the arch

(vii) Depth

A depth is the perpendicular distance between the extrados and intrados.

(viii) Crown

The highest point of the extrados/highest point of the external curve of the arch.

c)(i) Turning piece

Diagram

(ii) Classified by shape

* Flat/straight arch
* Square arch
* Segmental arch
* Semi-circular arch
* Pointed (Gothic) arch

Classified by material of construction

* Stone arch
* Brick arch

(iii) - An arch supports the weight imposted above

* An arch covers up open in the wall like door shape, window etc where steel beam may not be applicable.

(iv) Axed arch

3. a(i) - Good timber should be free from defects

- Good timber should not be easily attacked by pests and diseases

(ii)

Diagram

(iii) - Sapwood

* Hardwood

(iv) - Seasonal timber is easy to work with

- Seasonal timber can easily accept finishes

b. (i) Timber defects due to seasoning

* Collapse
* Case hardening

One due to conversion

* Waney edge

(ii) Structural timber defects due

* Knots
* Upset (rapture)

Dry rot affects timber in dump conditions whereas wet rot affects timber in contact with water.

Natural defects

Diagram

Artificial defects

Diagram

c) (i) The effect of sapwood on a piece of timber is that it is easily affected by pests and diseases.

(ii) Preservation is the application of toxic chemicals to timber whereas seasoning is the controlled drying out of excess moisture from timber.

(iii) Four methods of timer preservation

* Spraying
* Brushing
* Dipping
* Steeping

(iv) Pressure impregnation

4. a) (i) Vanishing

(ii) - Three objectives of painting any surface

* Protect the surface from weathering effects of the atmosphere
* Protect decay of wood and corrosion of metals.
* To provide a decorative finish to obtain a clean, colourful and pleasing surface.

(iii) Two methods of paint application

* Brushing
* Spraying

(iv) Surface preparation of a new timber door before any finish is done

* The work must be seasonal, clean, dry and free from dust
* It must be rubbed with fine grade sand paper or glass paper
* The knots may not destroy the paint
* The first coat or primary coat is applied on the surface to fill the pores and serve as a foundation for the subsequent coats.
* Nail, holes, creates and other defects are filled with putty or saw dust mixed with glue.
* The surface is then rubbed with a fine glass paper to level the surface.
* Second and succeeding coats or undercoating is applied
* This is also rubbed down to get good result
* The finishing is applied after the undercoat has dried.

b) Describe the following types of flour finishes, giving where each is applied

* Cement and sand screed. This one is used in residential and public buildings and garages.
* Plastic tiles (PVC) it is plastic materials fabricated in the form of tiles which are available in different sizes and colours. They are used in residential, schools, hospitals, offices, churches, hotels and shops.
* Woodstrip strips of timber of about 50x15 are laid and nailed on splayed pieces of timber which are secured in the cement morter. They are used in places like libraries, churches and hospitals.
* Terrasso is a special type of concrete flowing in which marble chips are used as aggregates mixed with white or coloured cement, ground or polished with carborundum stone to present a smooth, decorative surface. The whole area is sub0divided with suitable bays by use of strips made from copper, brass aluminium, or glass to reduce the risk of cracking. It is used in banks, hotels, office buildings and other public or social buildings.
* Wood blocks. These are small blocks of hardwood timber which are designed to be laid on screeded floor in various patterns like basket weave and herving some they can be used like basket weave and herving some. They can be used in places like churches, hospitals, hotels and other social buildings.

c) (i) Plattering is the application of wet mixes of fine cementing material and sand to the internal surface of a wall, whereas rendering is the application of the same mixes to external surfaces of wall.

c)(ii) Explain the procedures of plattering a brick wall.

All the mortar joint of wall to be plastered are left rough and projecting so as to give a key or how to the master. All the joints and surfaces are well cleaned and ensured that they are free from oil, grease etc if the surface is smooth or the wall to be plastered is old, then the mortar joints are racked out to a give a key to the plaster.

The projections over 12mm are knocked off so as to obtain a uniform surface of wall and also to reduce the consumption of plaster. All the cavities and holes inside the surface are properly filled in advance. The mortar joints and surfaces of wall are well washed, wetted with water and kept for at least 6 hours before plastering.

The first coat (i.e rendering coat) of plaster is applied by dashing against the wall surface. It is then sprinkled with sufficient quantity of water and rubbed well by means of floats.

5. a)(i) Concrete is an artificial building material which is obtained by mixing together certain inient materials called coarse and fine aggregates with active constituents called cement and water and any adventure approved by the engineer in-charge.

(ii) Mass plain concrete is a mixture of cement, water, fine and coarse aggregates without reinforcements. It may contain as mixtures if approved by the engineer in charge.

Reinforced concrete is a mixture of cement, water, fine and coarse aggregates with reinforcements inserted in.

Precast concrete this is concrete unit that is mixed, placed and cured at a factory under controlled conditions.

Cast-in-situ this concrete freshly mixed on site and placed in its final point of disposition or framework where it is left to cure and harden.

**(iii) Purpose of the concrete constituents**

**Cement** is a substance which binds together the particles of aggregates to form a mass of high compressive strength.

**Coarse aggregates** provide strength to the concrete.

**Fine aggregates** minimizes the percentage of voids so as to obtain a dense concrete.

**Water**. A portion of water will set up chemical reation which will harden the cement and the other portion is required to give the mix workability and will evaporatae from the mix while curving.

**Admixtures** are substances which are added to concrete to improve its properties like strength, hardness, water resistance, workability etc.

b(i) Batching is the proportioning of concrete ingredients

(ii) - Batching by volume

* Batching by mass

(iii) Two methods used for concrete mixing

* Hand
* Mechanical

c (i) Workability is the easy to mix, handle, transport, place and compact concrete.

(ii) Two methods of testing workability

* Slump test
* Compacting factor test

**Factors affecting workability of concrete**

* Shape of aggregates
* Grading and size of aggregates
* Ration of coarse and fine aggregates
* Efficiency of mixing
* Quantity of cement
* Quantity of water
* Use of any admixtures.

d (i) Water-cement ratio is the ration of water in a mix (excluding water absorbed already by the aggregates) to the weight of cement therein.

**(ii) Precautions about transporting**

* There should not be any vibration to cause segregation of aggregates \
* Containers should be water light to ensure that there is minimum loss of water and cement (groat).
* Time should be limited from place of mix to place of placement to avoid mitial setting of cement.

**Precautions about placing**

* Formwork or surface to be concreted should be clean, prepared and well watered.
* Concrete should be deposited in even and thin layers and compacted before the next is placed.
* Concrete should not be placed from high levels to avoid segregation of aggregates.

(iii) Caring is the process of keeping concrete moist to enable it to gain full strength, hardness and other desirable properties.

**(iv) Chemical failures of concrete**

* Carbonation. This is a type of deterioration which attacks exposed concrete. It is caused by the reaction calcium hydroxide or free lime and the carbondioxide in the atmosphere which forms calcium carbonate that reduces the alkalinity of concrete.
* Alkali-silica reaction which is also known as concrete cancer and is caused by a chemical reaction between the alkalis normally present in the concrete and contain forms of aggregates.

6. a)(i) Performance requirements of a window

* It should be strong enough when closed to resist the likely pressures and suctions due to wind and when open to be strong and stiff enough to resist the effects of gale force winds.
* Resistance to weather i.e should conserve heat and avoid cold droughts
* Durability and freedom from maintenance
* Fire safety
* Resistance to passage of sound
* It should provide security

(ii) Factors to be considered when determining size, location and shape of windows in a room.

* Size of the room
* Utility of the room
* Direction of wind and its speed.

b(i) Casement window is one whose shutter(s) open like a door.

**(ii) Advantages of a casement window**

* They are simple to construct
* They are easy to clean from in and out of the building
* They can be opened to any required position.

Diagram

c (i) Glazing is the securing of glass into prepared openings such as windows, doors and partitions.

(ii) Methods of fixing glasses

Diagram

(iii) Types of glass

* Clear sheet glass
* Float glass
* Translucent glass
* Wired glass.

d(i) - Dormer window this is a vertical window built in the sloping side of a pitched roof.

* Skylight this is the type of fixed window provided on the sloping surface of a pitched roof, the window being parallel to the sloping surface.

(ii) Two iron monger used to hold the casement sash in the same position

* Casement fastener
* Casement stay

(iii) Two methods of fixing window frames

* Built-in
* Prepared opening