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TED(15)3011 (REVISION – 2015)

DIPLOMA EXAMINATION IN ENGINEERING / TECHNOLOGY/ MANAGEMENT/ COMMERCIAL PRACTICE –

CONSTRUCTION MATERIALS AND ENGINEERING

(Civil Engineering)

ANSWER KEY

(Maximum marks: 100) Time: 3 hours

PART – A

(Maximum marks: 10)

I. Answer the following sentences in one or two sentences. Each question carries 2 marks.

1. The process of keeping the concrete surfaces wet for a certain period after placing of concrete so as to promote the hardening of concrete by control of temperature and moisture movement from and into the concrete is called curing.
The methods of curing are Ponding with water, covering concrete with wet jute bags, Intermittent spraying with water and continuous sprinkling of water, Covering concrete water proof paper or polyethylene sheets and holding it in position etc.

(2 Marks)

2. The process of drying (expelling moisture) of timber is known as seasoning.
<u>Objects of seasoning</u>

a) To reduce the weight of the timber
b) To make timber fit for receiving coatings of paint
c) To make timber burn readily, if used as fuel.
d) To impart hardness, strength, and stiffness to timber
e) To make timber safe from the attack of fungi, insects etc.
f) To reduce the tendency of timber to warp, crack and shrink.

(2 Marks)

3. It is a substance which is used to remove excess material by cutting. It polishes soft material and gives it an attractive appearance. Examples:- Diamond, garnet, flint, emery, corundum, carbonado, sandstone, carbides of aluminium, boric acid, silicon.

(2 Marks)

4. Double Flemish bond present the same appearance both in the facing and backing. In Single Flemish bond facing consist of Flemish bond and backing consist of English bond.

(2 Marks)

5. (a) It is the clear vertical distance between the tread of a step and the soffit of the flight or the ceiling of a landing immediately over it.
(b) The horizontal distance between the faces of two consecutive risers.

(2 Marks)

PART – B

(Maximum marks: 30)

II. Answer any five of the following questions. Each question carries 6 marks.

1. a) Structure of stones.

b) Texture of stones

c) Strength

d) Appearance

e) Durability

f) Hardness

g) Porasity and aborption

h) Facility for working

i) Seasoning

j) Specific gravity

k) Resistance to fire.

l) Resistance to electricity

(6 Marks)

2. Ease with which the fresh concrete can be mixed, placed, compacted and finished I termed as workability.

Factors affecting workability are

a) Water cement ratio

b) Grading of aggregate

c) Proportion of coarse to fine aggregate

d) Shapes of aggregate

e) Quality of cement

f) Quality of water

g) Efficiency of mixixng.

(6 Marks)

3. The following are the properties of Asphalt

1) It is a tough and durable material.
2) It is a waterproof material and can be easily cleaned.
3) It is good insulator of electricity, heat and sound.
4) It is non inflammable and non absorbent.
5) It is not attacked by acids and is safe against vermin.
6) It is resilient and reasonably elastic.

The uses of Asphalt are

1) Used as damp proof course
2) As waterproof layer for tanks, basements, swimming pools etc.
3) For preparing paints and roofing felts.
4) For constructing roads and pavements etc.

(6 Marks)

4. The glass may be grouped into the following categories

1) Soda lime glass – This is a soft glass. This is a mixture of sodium silicate and calcium silicate. It is used in the manufacture of glass tubes and other laboratory apparatus.
2) Potash lime glass – This is also called bohemian glass or hard glass. It is the mixture of potassium silicate and calcium silicate. This type of glass is used in the manufacture of glass articles which have to withstand high temperatures such as combustion tubes.
3) Potash lead glass – This is also known as flint glass. It is mainly a mixture of potassium silicate and lead silicate. It is used in the manufacture of artificial gems, electric bulbs, lenses and prisms etc.
4) Common glass – This is also known as flint glass. It is mainly a mixture of sodium silicate, calcium silicate and iron silicate. It is mainly used in the manufacture of bottles for medicine.
5) Borosilicate glass – Borosilicate glass is made mainly of 70% to 80% silica and 7% to 13% boric oxide with smaller amount of alkalis and aluminium oxide. They are used for the manufacture of laboratory apparatus

(6 Marks)

5. The advantages of hollow block masonry are

a) Uniform size and less weight
b) Rapid construction
c) Great saving of material
d) Good insulating properties against sound, heat and dampness
e) No protective covering is required as it can safely withstand atmospheric action
f) Obtained in different shapes and standard size.
g) If necessary tough surface of concrete blocks makes plaster easier.

(6 Marks)

6. Defects in plastering are
    1) Blistering of plastered surface – formation of small patches of plaster swelling out beyond the plastered surface, arising out of late slaking of lime particles in plaster.
    2) Cracking – formation of cracks or fissures in the plaster work.
    3) Crazing- formation of a series of hair cracks.
    4) Efflorescence – appearance of whitish patches due to the presence of salts in plaster making materials a well as building materials.
    5) Flaking – formation of very loose mass of plastered surface due to poor bond between successive coats.
    6) Peeling – complete dislocation of some portion of plastered surface resulting in the formation of patch.
    7) Popping – formation of conical hole in the plastered surface due to the presence of some particles which expand on setting.
    8) Rust stains – formed when plaster is laid on metal.
    9) Uneven surface- due to poor workmanship.

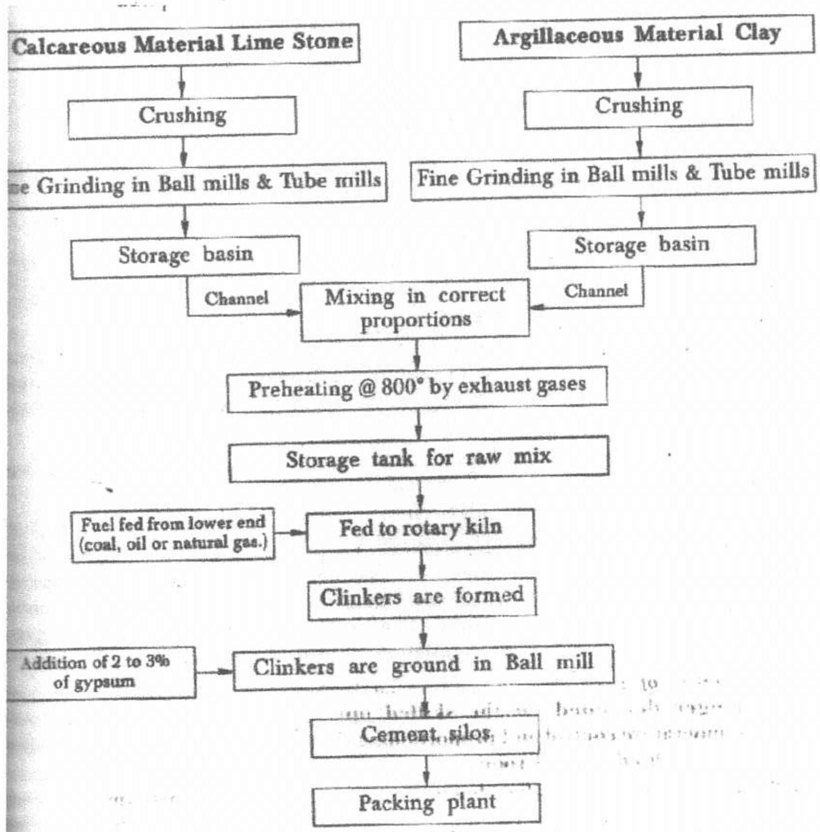
(6 Marks)

7. Requirements of a good floor are
    a) Appearance
    b) Initial Cost
    c) Durability
    d) Noiselessness
    e) Damp proof
    f) Cleanliness
    g) Maintenance
    h) Indentation
    i) Slipperiness
    j) Fire resistant

(6 Marks)

PART – C
(Maximum marks: 60)
(Answer one full question from each unit. Each full question carries 15 marks)

III. a)



III.

Flow diagram of dry process

b) Characteristics of good preservatives are

1) It should be strongly toxic to insects
2) It should penetrate readily into timber.
3) It should not be soluble in water.
4) It should not change in composition under ordinary climatic condition.
5) It should be able to cover large area with a comparatively small quantity.
6) It should allow coats of paint without discolouring.
7) It should be cheap and available.
8) It should not reduce the strength of the timber and should be non corrosive to metals in contact
9) It should not catch fire easily.
10) It should be pleasant in colour and give an attractive appearance to the wood work.
11) It should be harmless to human beings.

(7 Marks)

IV. **a)** The properties of cast iron are

1) If placed in soft water, it becomes soft.
2) It can be hardened by heating and sudden cooling, but it cannot be tempered.

3) It cannot be magnetized
4) It does not rust easily
5) It is fusible.
6) It is hard but it is brittle also hence does not absorb shock.
7) It has crystalline fibrous and granular structure.
8) It cannot be welded.
9) It is unsuitable for forging work.
10) Its melting point is about 1200^0C.
11) Its specific gravity is 7.5
12) Strong in compression but weak in tension.

The Uses of Cast Iron are

1) For making cisterns, water pipes, gas pipes, and sewers, manhole covers and sanitary fittings.
2) For making ornamental castings such as brackets, gates, lamp posts, spiral staircases etc.
3) For making parts of machinery which are not subjected to heavy shocks.
4) For manufacturing compression members like columns in buildings, bases of columns etc.
5) For preparing agricultural implements.
6) For preparing rail chairs, carriage wheels etc.

(8 Marks)

b) In the manufacturing of bricks the following operations are involved

1) Preparation of clay
   i) Unsoiling
   ii) Digging
   iii) Cleaning
   iv) Weathering
   v) Blending
   vi) Tempering
2) Moulding
   i) Hand moulding
      a) Ground moulded bricks
      b) Table moulded bricks
   ii) Machine moulding
3) Drying
4) Burning

(7 Marks)

V. **a)** The different types of paints are

1) Aluminium paint
2) Anti corrosive paint
3) Asbestos paint
4) Bituminous paint

5) Cellulose paint
6) Cement paint
7) Colloidal paint
8) Emulsion paint
9) Enamel paint
10) Graphite paint
11) Inodorous paint
12) Luminous paint
13) Oil paint
14) Plastic paint
15) Silicate paint
16) Synthetic rubber paint.

(8 Marks)

b) PVC – Poly vinyl chloride. Obtained as a fine white powder which can be processed to give products ranging from soft rubbery material to hard rigid sheets. Before processing PVC is mixed with a small substance called heat stabilizer. The purpose of this is to reduce the tendency of polymer to decompose if it is over heated. Depending upon type of PVC some ingredients are added with it and this stage is called compounding. The PVC is used for doors and windows, pipes, electric wiring and cables etc.

Adhesives – The material used for binding the surface of wood, metal, plastics and glass. Their binding properties are partly due to mechanical interlocking of their molecules with the pores in the surface to be adhered. But mainly due to the condensation and setting intermolecular forces and bonds. The main varieties of adhesives are Natural and Synthetic adhesives. Example for Natural adhesives are Animal protein glues, Vegetable starch adhesives etc. and for Synthetic adhesives are Phenol formaldehyde, Vinyl glues etc.

Abrasives - It is a substance which is used to remove excess material by cutting. It polishes soft material and gives it an attractive appearance. Examples:- Diamond, garnet, flint, emery, corundum, carbonado, sandstone, carbides of aluminium, boric acid, silicon.

(7 Marks)

VI. **a)** Characteristics of an ideal varnish are

1) It should render the surface glossy
2) It should dry rapidly and present a finished surface which is uniform in nature and pleasing in appearance.
3) The colour of varnish should not fade away when the surface is exposed to the atmospheric actions.
4) The protecting film developed by varnish should be tough, hard and durable.
5) It should not shrink or show cracks after drying.

Ingredients of varnish

1) Resins or resinous substance – The commonly used resins are copal, lac or shellac and rosin
2) Driers – The function of a drier in varnish is to accelerate the process of drying. The common driers are Litharge, White copper and lead acetate.
3) Solvents – Depending on the nature of resin the type of solvents are decided.

(8 Marks)

b) The properties of rubber are

1) It can absorb shocks due to impact
2) It can contain liquids and gases.
3) It is a bad conductor of heat
4) It possess the quality of flexibility
5) It resist abrasion in a better way
6) The synthetic rubber offers great resistance to acids, petroleum products etc.
7) It can moulded to desired nature.

The uses of rubber are

1) Used a gaskets to make doors and windows airtight
2) Lining material for parts of machines subjected to heavy friction.
3) Preparing tyres for vehicles and machines
4) Rubber threads
5) Hose pipes to carry petrol and kerosene oils etc.
6) Insulating material

(7 Marks)

VII. **a)** Different methods of underpinning are

i) Pit Method
ii) Pile Method

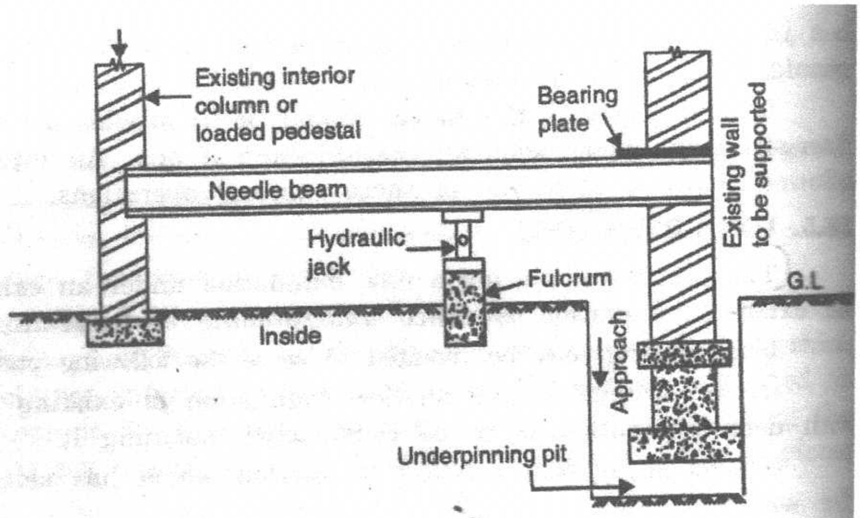


FIG. 18.6. PIT METHOD WITH CANTILEVER NEEDLE.

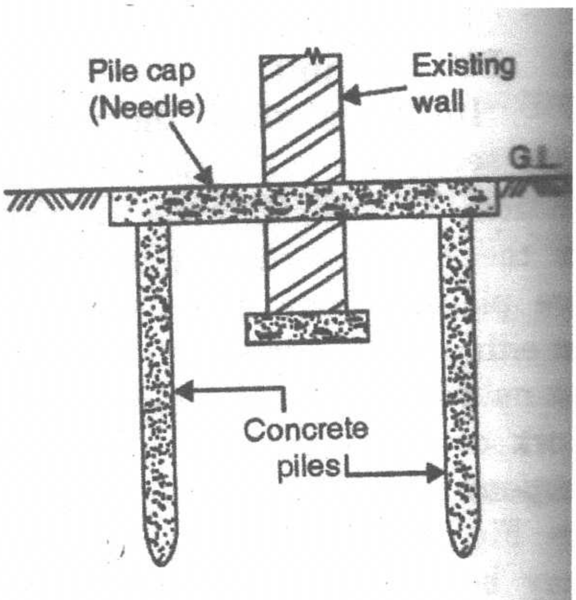


FIG.18.7. PILE METHOD.

(8 Marks)

b) Depending upon the material of construction partitions can be divided into the following

i) Brick partitions
ii) Hollow block, clay block terracotta block partition
iii) Glass block partition
iv) Concrete partitions
v) Metal lath and plaster partition
vi) AC Sheet or GI Sheet partition
vii) Hard board wood wool board partition
viii) Wooden partition

(7 Marks)

VIII. a) The following methods are adopted to make a building damp proof

1) Use of DPC
2) Integral damp proofing
3) Surface treatment
4) Cavity wall construction
5) Guniting
6) Pressure grouting

(8 Marks)

b) Advantages

1) Crack free under service loads and prevents corrosion.
2) Shear strength is more
3) Capable of carrying large loads over long spans
4) Capable of resisting both tension and compression

5) High ability to absorb energy

Disadvantages

1) Higher cost a stronger materials are used
2) Complicated form work
3) End anchorages and bearing plates are required.
4) Labour costs are greater
5) More conditions must be checked in design and closer control of every phase is required.
6) Short span member and single unit application are uneconomical

(7 Marks)

IX. **a)** Different types of doors are

1) Classification on the basis of arrangement of components
    - i) Battened and ledged door
    - ii) Battened Ledged and braced door
    - iii) Battened Ledged and framed door
    - iv) Battened Ledged braced and framed door

2) Classification on the basis of method or manner of construction
    - i) Framed and paneled door
    - ii) Glazed or sash door
    - iii) Flush door
    - iv) Louvered door
    - v) Wire – Gauged door

3) Classification on the basis of working operations
    - i) Revolving door
    - ii) Sliding door
    - iii) Swing door
    - iv) Collapsible steel door
    - v) Rolling steel shutter door

(8 Marks)

b) Sunshades – for the protection of doors, windows, and ventilators from the direct sun rays or rain water, horizontal protections from the wall are provided with RCC along with the lintels are called sunshades.

Sunbreakers – Sunbreakers are of horizontal and vertical. Horizontal are used in the form of louvers so that sunrays do not enter the building. Vertical type are found effective on East and West side.

Canopy – They are shelter to an opening in a building consisting of extended roof with or without wall.

(7 Marks)

X. **a)** Classification of stairs based on arrangement of steps

1) Straight flight stairs
2) Quarter turn stairs
3) Half turn stairs
    a) Dog legged stairs
    b) Open newel stairs
4) Circular or spiral
5) Geometrical stairs
6) Bifurcated stairs

(8 Marks)

b) The lintels are classified as

1) Timber lintel
2) Stone lintel
3) Brick lintel
4) Steel lintels
5) Reinforced concrete lintels

(7 Marks)