TED (15) 3011
(Revision - 2015)

A20 – A0101

Reg. No……
Signature …….

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE, APRIL – 2020

CONSTRUCTION MATERIALS AND ENGINEERING

[Maximum Marks: 75] [Time: 2.15 Hours]

PART-A

(Answer ***any three*** questions in one or two sentences. Each question carries 2 marks)

I. 1. Differentiate between fine aggregates and course aggregates.
2. Define quick lime and slaked lime.
3. List the functions of bases in paints.
4. Define underpinning.
5. Differentiate between hip and valley. (3 x 2 = 6)

PART-B

(Answer any ***four*** of the following questions. Each question carries ***6*** marks)

II 1. Explain slump test.
2. List the properties of distempers.
3. Classify different types of varnish and briefly describe them.
4. State the requirements of a good formwork.
5. List the advantages of hollow block masonry.
6. Write short notes on (i) Revolving door (ii) Dormer window and (iii) Rising butt hinge.
7. Enumerate the requirements of a good stair case. (4 x 6 = 24)

PART-C

(Answer ***any of the three units*** from the following. Each full question carries 15 marks)

UNIT – I

III (a) List the qualities of good bricks. (8)
(b) Define bulking of sand. Explain its importance. (7)

OR

IV (a) Discuss the various stages of concrete production. (8)
(b) List the properties of mild steel. (7)

UNIT – II

V (a) Explain the following types of glasses used in building construction.
(i) Float glass (ii) Laminated glass (iii) Tinted glass (iv) Glass blocks. (8)

(b) List the properties of PVC. (7)

OR

VI (a) List the properties of plaster of paris. (8)

(b) Define asphalt. Mention its properties. (7)

UNIT- III

VII (a) Define bonding in brick masonry. List the rules for bonding in brick masonry. (8)

(b) Describe the causes of dampness in buildings. (7)

OR

VIII (a) Explain the different types of pointing. (8)

(b) Mention the situations which demand shoring and under pinning. (7)

UNIT - IV

IX (a) Explain with neat sketches: (i) Combined footing (ii) Cantilever footing. (8)

(b) Describe with neat sketches: (i) Relieving arch (ii) Venetian arch. (7)

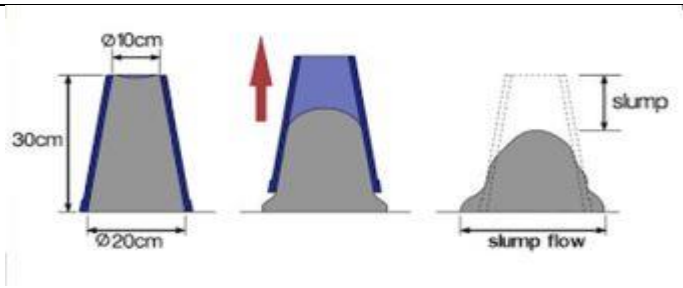
OR

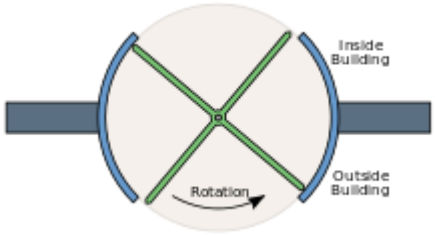
X (a) Define (i) Gable roof (ii) Ridge piece (iii) Jack rafters (iv) Battens (8)

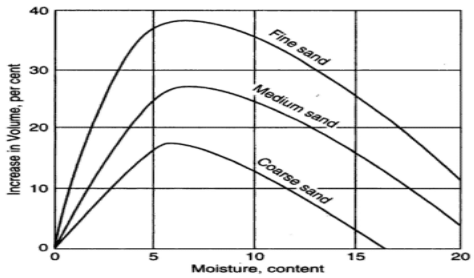
(b) List the factors to be considered in the selection of ceiling materials. (7)

Month and Year:- April 2020
Revision:- 2015
Course Title:- Construction Materials and Engineering
Course code:- 3011

Question No	Answer	Splitup score	Sub total	Total
I.1	Differentiate between fine aggregates and course aggregates • Fine aggregate are the aggregates which passes through 4.75mm IS sieve are called Sand • Coarse aggregates are the aggregates which having size greater than 4.75mm is called as Coarse aggregates. Or Coarse aggregate are the aggregate which is retained on 4.75 mm IS sieve.	1 1	2	10
I.2	Define quick lime and slaked lime Quick Lime:- When lime stone is burnt, Carbon dioxide (CO_2) is given out and Quick lime (CaO) is obtained. $CaCO_3 \rightarrow \underset{\text{Quick lime}}{CaO} + CO_2$ Slaked Lime:- When water is added to quick lime and it turn to Calcium hydroxide (Slaked lime). This process is called Slaking	1 1	2	
I.3	List the Functions of base in paint • Base forms bulk of paint • Base determines the quality of paint • Base makes the paint harder, opaque, elastic • Base prevent the paint from shrinking	0.5 0.5 0.5 0.5	2	
I.4	Define underpinning It's the process of providing new foundation under an existing foundation or it is the process of strengthening an existing foundation	2	2	
I.5	Differentiate between hip and valley. • Hip:- external angle formed at the intersection of two roof slopes. • When two roof surfaces together at an angle less than 180 degree,a valley is formed.	1 1	2	
II.1	Explain slump test Slump test is field test as well as lab test to determine the workability of fresh concrete. Procedure for slump test:- 1) Prepare the concrete mix and fill the slump cone in 3 layers. Provide 25 times tamping to each layer. 2) Cut the excess concrete and level the top surface. 3) Remove the slump cone slowly upward 4) Measure the slump value Slump:- The difference in height between the concrete before removing the slump cone and height of the concrete after removing the cone.	4 2	6	

				
II.2	List the properties of distempers. (i) On drying, the film of distemper shrink. Hence it leads to cracking and flaking, if the surface to receive distemper is weak.: (ii) The coatings of distemper are usually thick and they are more brittle than other types of water paints. (iii) The film developed by distemper is porous in character and it allows water vapour to pass through it. Hence it permits new walls to dry out without damaging the distemper film. (iv) They are generally light in colour and they provide a good reflective coating. (v) They are less durable than oil paints. (vi) They are treated as water paints and they are easy to apply.	6	6	
II.3	Classify different types of varnish and briefly describe them. **Oil varnishes** These varnishes use linseed oil as solvent in which hard resins such as amber and copal are dissolved by heating. Oil varnishes are recommended for all external wood work, and for joinery and fittings. **Spirit varnishes or lacquers** These varnishes are methylated spirit of wine as solvent in which soft resins such as lac or shellac are dissolved. They dry quickly, but are not durable. It is commonly used on furniture. **Turpentine varnishes** These varnishes use turpentine as solvent in which soft resins such as gum dammer, mastic and rosin are dissolved. The varnish dries quickly, but is not so durable. These are cheaper than oil varnishes. **Water varnishes** These varnishes are formed by dissolving shellac in hot water, using enough quantity of ammonia, borax, potash or soda. Water varnishes are used for varnishing wall papers, maps pictures, book jackets, etc.	1.5 1.5 1.5 1.5	6	

II.4	State the requirements of a good formwork • Easy removal with least amount of hammering • Materials should be cheap and durable • Formwork should be water proof, less leakage through the joint • Rigidity against deformation • Inside surface of form work should be smooth • Swelling and shrinkage should be minimum.	6	6	
II.5	List the advantages of hollow block masonry • Hollow blocks are light in weight, so construction work can be done speedy. • As hollow block is hollow, there is considerable saving in material. • As blocks are larger than bricks, no. of joints are less. So there is considerable amount of saving in mortar. • Rough surface makes plastering so easier and economical. • Hollow block masonry can withstand high temperature- fire protection. • Rapid execution of work.	6	6	
II.6	Write short notes on (i) Revolving door (ii) Dormer window and (iii) Rising butt hinge (i) Revolving door:- It's a door to a large building in which four partitions turn about a central axis. Or it's a door that provided when people tend to enter and leave very quickly.  (ii) Dormer window:- Dormer windows are the windows provided at slopping roof. It is provided for to enter more day light.  (iii) Rising butt hinge:- It's a door hinge having a spiral groove winding about its knuckle, or having the joints of the knuckle oblique, so that when opened, the door is lifted and clears the carpet.	2 2 2	6	

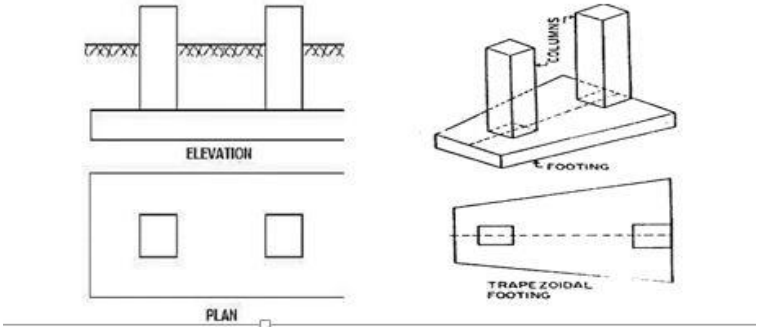
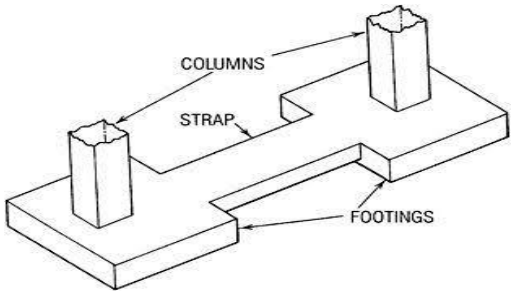
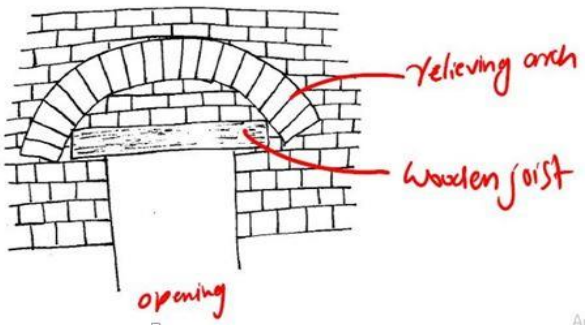
II.7	Enumerate the requirements of a good stair case. 1) Location:- It should preferably be located centrally, ensuring sufficient light and ventilation 2) Width:- The width of stairs for public buildings should be 1.8 m and for residential buildings 0.9 m. 3) Length:- The flight of the stairs should be restricted to a maximum of 12 and minimum of 3 steps. 4) Head room:- The distance between the tread and soffit of the flight immediately above it, should not be less than 2.1 to 2.3 m. This much of height is maintained so that a tall person can use the stairs with some luggage on its head. 5) Materials:- Stairs should be constructed using fire resisting materials. Materials also should have sufficient strength to resist any impact. 6) Landing:- The width of the landing should not be less than the width of the stair..	6	6	
III.a	List the qualities of good bricks (i) Bricks should be table moulded, well burnt in kilns, copper coloured, free from cracks and with sharp and square edges. (ii) Bricks should be uniform shape and should be of standard (iii) Bricks should give clear ringing sound when struck each other. (iv) Bricks when broken should show a bright homogeneous compact structure free from voids. (v) Bricks should not absorb water more than 20 percent by weight for first class bricks and 22 percent by weight for second class bricks, when soaked in water for a period of 24 hours. (vi) Bricks should be sufficiently had no impression, should left on brick surface, when it is scratched with finger nail. (vii) Bricks should be low thermal conductivity and they should be sound proof. (viii) Bricks should not break when dropped flat on hard ground from a height of about one meter.	8	8	
III.b	Define bulking of sand. Explain its importance. The increase in the volume of sand due to the presence of moisture is known as bulking of sand. This is due to the fact that moisture forms a film of water around the sand particles and this results in an increase in the volume of sand. The extent of bulking depends on the grading of sand. The finer the material the more will be the increase in volume for the given moisture content. For a moisture content of 5–8 per cent, the increase in volume may be about 20–40 per cent depending upon the gradation of sand. When the moisture content is further increased, the sand particles pack near each other and the amount of bulking is decreased.  	7	7	

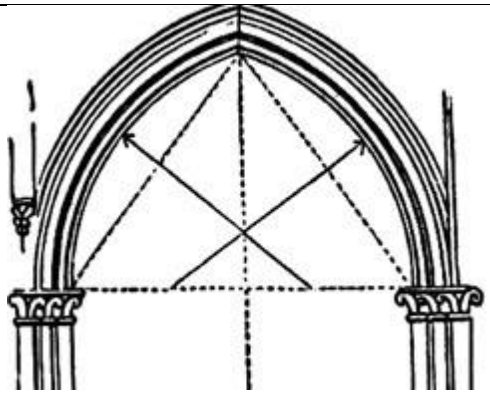
IV.a	Discuss the various stages of concrete production 7 stages are there for manufacture of concrete. 1. Batching or proportioning 2. Mixing 3. Transporting 4. Placing 5. Compacting 6. Curing 7. Finishing 1. Batching or proportioning The process of measuring ingredients or materials to prepare concrete mix is known as batching of concrete. Batching is of two, a) Weigh batching b) Volume batching 2. Mixing of concrete Mixing of concrete is simply defined as the complete blending of the material to make the mixture homogeneous. Mixing is divided into 2 a). Hand mixing b). Machine mixing 3. Transporting of concrete It is the process of conveying the mixed concrete to the place where concrete to be needed. Modes of transporting concrete:- 1. Mortar pan 2. Wheel barrow 3. Chute 4. Transit mixer 4. Placing of concrete The deposition or dumping of freshly prepared concrete in the place where it is to be harden. 5. Compaction Compaction is the process of expelling the entrapped air present in the concrete and packs the aggregate particles together so as to increase the density of concrete. Compaction is of 2 type a) Hand compaction b) Machine compaction (by vibrators) 6. Curing Curing of concrete is defined as providing adequate moisture to develop hydration process and time to allow the concrete to achieve the desired properties for its intended use. 7. Finishing of concrete It is the final step of concrete manufacture. In this step we remove the mould or form work the surface will finish if it is not.	8	8	

IV.b	List the properties of mild steel. • High tensile strength. • High impact strength. • Good ductility and weldability. • A magnetic metal due to its ferrite content. • Good malleability with cold-forming possibilities. • Not suitable for heat treatment to improve properties • Many application like cutlery and poles, cook wares, fencing..etc	7	7	
V.a	Explain the following types of glasses used in building construction. (i) Float glass (ii) Laminated glass (iii) Tinted glass (iv) Glass blocks. Float glass:- • Most widely used type of glass • Monolithic and highly transparent • Produced by flowing molten gas over a bath of molten tin and slowly cooling • Used on window, doors etc Laminated glass:- Made by sandwiching two glass plates with a high resistance plastic skin in between them Uses- Facades, balconies, guard rails, partition, show case, floorings. Tinted glass:- Tinted glass is any glass that is treated with a material to minimize the transmission of light through it. In vehicles, it is mainly used to avoid excess heat and block the sun rays. Glass blocks:- Glass block is also known as glass brick is an architectural element made from glass. The appearance of glass blocks can vary in color, size, texture and form. Glass bricks provide visual obscuration while admitting light. The modern glass block was developed from pre-existing prism lighting principles in the early 1900s to provide natural light in manufacturing plants. Today glass blocks are used in walls, skylights, and sidewalk lights.	2 2 2 2	8	
V.b	List the properties of PVC • Rust proof, thermal proof, dust proof and water proof • It provides alternative to wood in many cases • PVC resist dust penetration. • Unaffected by costal saline air and dry heat. • Available in different color and shades • They don't fade, corrode, flake or warp • Require no maintenance. Only occasional cleaning is required. • Better thermal insulator	7	7	

VI.a	List the properties of plaster of paris Plaster of paris is produced by heating gypsum to a temperature about 150 degree celcius. It can be easily shaped when wet. Plaster of paris is white in color and available in powder form. Uses:- used for aesthetic appearance, wall panel, casting works, ceiling works and acoustic works. Properties of plaster of paris:- • Plaster of Paris is easy to spread and level. • It is fire resistant highly. • It forms a thick surface to resist normal knocks after drying. • It expands very slightly on the setting. • It does not cause cracking of surfaces. It gives a decorative interior finish.			
VI.b	Define asphalt. Mention its properties. Asphalt is a mechanical mixture of Alumina, Lime, Silica.. Black or brownish in color. Used in- water proofing floors and roofs, DPC, Swimming pools, roads and pavements Properties of Asphalt:- • Remains in solid state at low temperature. • Becomes liquid at 50 to 100 degree Celsius. • Asphalt is Water proof and sound proof • Asphalt is fire proof and acid proof.			
VII.a	Define bonding in brick masonry. List the rules for bonding in brick masonry. Bonding is an arrangement of bricks in masonry such as walls or columns Rules for bonding in brick masonry:- • Bricks should be confirm to IS specification • Bricks should be immersed in water for a sufficient time to avoid them from absorbing water from the mortar. • Bricks should be laid on their beds with the frog upward • Brick bats should be avoided as far as possible • Maximum height of construction /day is 1.5 m • Joint thickness should be thin • Wall should be raised uniformly • Good quality mortar and proper bonding should be conformed.	2 6	8	
VII.b	Describe the causes of dampness in buildings. Dampness is the presence of hygroscopic or gravitational moisture. Building should be remain dry and free from moisture. Dampness reduces the strength of building. Dampness gives un-hygenic conditions. <u>Causes of dampness in building:-</u> i. Rising of moisture from ground ii. Action of rain iii. Exposed tops of wall (eg:- Parapet wall, compound wall)	2 5	7	Point

	iv. Inadequate roof slope			
VIII.a	Explain the different types of pointing Pointing is the action of filling joints of masonry with rich mortar. Its done for good strength and appearances. Joints are racked out to a depth of about 20mm. These spaces are filled up by suitable mortar in the decided shape. Lime mortar and Cement mortar are used. <u>Types of pointing:-</u> *Flush Pointing*- It is most common type of pointing. Face of pointing is vertical *Recessed Pointing*- Channel shaped appearance. 5mm back from face. *Grooved pointing*- This pointing is also known as Rubbed pointing or keyed pointing. Semi-circular depression at mid height of mortar joint. *Tuck pointing*- 3mm projection from face.5mm back from face. Weathered pointing- This pointing is used for to drain away the rain water easily.	8	8	
VIII.b	Mention the situations which demand shoring and under pinning Shoring:- Shoring is a temporary supporting structure to support an unsafe structure. <u>When it is demands</u> • When addition and alteration is required to an unsafe structure. • Shoring is needed when removal of a defective portion of building. • When unequal settlement during the construction. • To insert underground pipelines. Underpinning:- Placing a new foundation under an existing foundation. It is done for to strengthen the existing foundation. <u>When it is demands</u> • When a building with deep foundation is constructed near a building with shallow foundation. This shallow foundation should be strengthened • To protect from excessive settlement of foundation • To improve bearing capacity of soil. • To provide basement to an existing structure.			

IX.a	Explain with neat sketches: (i) Combined footing (ii) Cantilever footing. Combined footing These are the footings made common to more than one column. Opted when columns are closely spaced also opted when dimensions of one side restricted.  Cantilever footing These are the footings which near by footings are connected by using a strap beam. Its opted when edge of footing is cannot extend beyond property line.  	2 2 2 2	8	
IX.b	Describe with neat sketches: (i) Relieving arch (ii) Venetian arch Relieving arch:- Relieving arches are the arches which is constructed above wooden or stone lintel. Main function of relieving arch is to strengthen the arch below  Venetian arch:- Venetian arch is also pointed arch but its crown is deeper than springing's. It contains four Centre's, all located on the springing line. A usually pointed arch with a band wider at the peak than at the spring.	7	7	

				
X.a	Define (i) Gable roof (ii) Ridge piece (iii) Jack rafters (iv) Battens Gable roof:- A gable roof is the classic, most commonly occurring roof shape in those parts of the world with cold or temperate climates. It consists of two roof sections sloping in opposite directions and placed such that the highest, horizontal edges meet to form the roof ridge Ridge piece:- A ridge piece is a horizontal beam along the ridge of a roof, into which the rafters are fastened. Jack rafters:- Any rafters, which is shorter than common rafters is known as Jack Rafters. Battens:- Thin strips of wood which are fixed on rafters or ceiling to support the roof ceiling.	2 2 2 2	8	
X.b	List the factors to be considered in the selection of ceiling materials. • Should be durable and portable • Material used should be light in weight • Should be water, sound and fire proof • Should have aesthetic looking after installation. • Should possible to install easily • Should have enough strength and integrity • Possible to cast in any shape • Should be flexible in nature.	7	7	
