Important instruction 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 the candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.

5) Credits may be given stepwise for numerical problems. In some cases the assumed constant values may be 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.

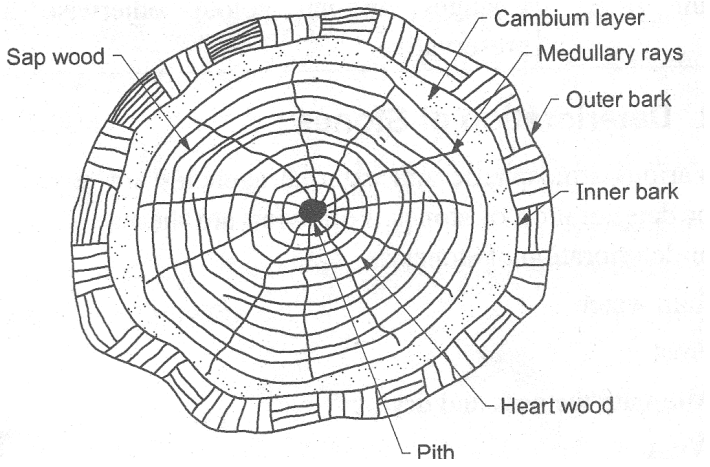
7) For programming language papers, credit may be given to any other program based on equivalent concept.

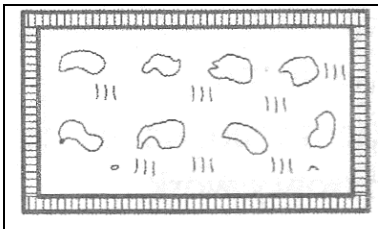
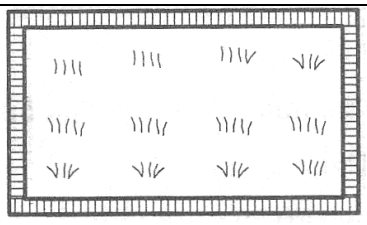
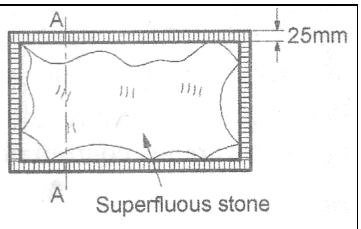
Q.No.	Answer	Marks
1	**Attempt any Ten**	**2x10=20**
a)	Civil engineering is the branch of engineering which deals with the planning, designing, estimating, execution and maintenance of various structures like building, road, railways, airports, dams, canals, tunnels, bridges, docks, harbours, water supply and sanitary units etc.	**2 M**
b)	**The basic areas in civil engineering are as follows:-** • Surveying • Transportation Engineering • Fluid Mechanics • Irrigation Engineering • Structural Engineering • Geo-technical Engineering • Foundation Engineering • Environmental Engineering • Quantity Surveying • Earthquake Engineering • Infrastructure Development • Construction Engineering	**ANY FOUR POINTS ½ X 4 = 2 M**
c)	**Igneous Rock:** At the time of volcanic eruptions, molten mass called as magma forcedly comes up on the surface of earth at high temperature. After cooling down this molten mass; it becomes solid mass which is called as igneous rock.	**2 M**
d)	**Properties of bitumen** : • It is mostly available in solid or semi-solid state • It is completely soluble in carbon-disulphide (CS_2) • It is black or brownish black in colour. • It has adhesive properties when comes in contact with heat. • When heated, it undergoes melting and gives distinctive odour.	**ANY TWO POINTS ½ X 2 = 1 M**

Q.No.	Answer	Marks
	Uses of Bitumen : • Bitumen emulsion can be used as stabilizing agents. • Blown bitumen can be used as roofing and damp-proofing flets. • Blown bitumen can also used in the manufacture of pipe asphalt and joint filers. • Plastic bitumen is used for filling cracks in masonry structure for stopping leakages. • Cut-back bitumen can be applied cold as bitumen paints. • Bitumen is also extensively used for constructing different bituminous road pavements. • It is also used as a stabilizer for constructing stabilized earth road.	ANY TWO POINTS ½ X 2 = 1 M
e)	**Dressing of Stone**: The process of giving required shape and size to the quarry stone, to improve the appearance of stone surface, with the help of tools is called as dressing of stone.	2 M
f)	**Major ingredients of cement** are basically of two types **1. Calcareous (Lime)** • Chalk • Sedimentry Limestone • Metamorphic Limestone • Carbonatite • Marl • Alkali Wastes **2. Argillaceous (Alumina, Silica)** • Clay • Slate • Shell • Cement rock **Gypsum**	ANY TWO POINTS ½ X 2 = 1 M ANY TWO POINTS ½ X 2 = 1 M

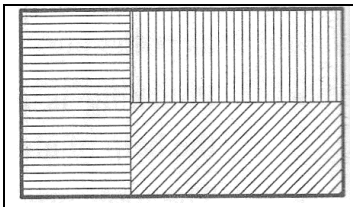
Q.No.	Answer	Marks
g)	Artificial wood for i) Notice boards – **Particle board** ii) Furniture in hotels – **Plywood or Nuwood or Rubberwood**	 1 M 1 M
h)	**Jute fiber**: Jute is a long, soft, shiny vegetable fiber or the rough fiber made from the stems of a tropical plant that can be span into coarse strong threads. It is one of the cheapest natural fibers. Used for making twine, rope, matting, for plumbing work to stop leakage, packing and making fabrics.	1 M Any 2 Uses ½ X 2 = 1M
i)	**Brand names of water proofing materials** • Dr. Fixit • Roff • Sika • Basf India Ltd • Impermo • Water Seal • Krishna Conchem • Sunanda Chemical • Ridex, Etc.	ANY FOUR POINTS ½ X 4 = 2 M
j)	**Damp-proofing**: Damp proofing is a treatment given to the building components during construction to prevent entry of moisture. Water-proofing: In building construction, mortar brick, stone and concrete are having tendency to get deterioted due to passage of time. Due to which cracks and pores are formed in this material and water leakage occurs. This leakage of water is stopped by using special materials called as water proofing materials.	1 M 1 M

Q.No.	Answer	Marks
k)	**Standard dimensions of :**	
	i) Conventional brick : **230mm X 114mm X 75mm**	1 M
	ii) Standard / Modular Brick : **190mm X 90mm X 90mm**	1 M
l)	**Properties of Blast furnace slag :**	
	• Good abrasion resistance • Good soundness characteristics • High bearing strength • Low thermal conductivities	ANY TWO 1 X 2 = 2 M
m)	**Rice Husk :** The hard protecting coverings of grains of rice is known as rice husk.	1 M
	Uses as Construction materials • In manufacturing of bricks • In thermal insulation of building, rice husk can be used. • The ash produced after the husk has been burned is high in silica, which is used in production of aggregates and fillers for concrete and board. • Used in generation of heat energy, steam energy and electricity generation.	Any 2 Uses ½ X 2 = 1M
n)	**Environmental Engineering** : It is a branch or basic area of the civil engineering, which deals with water supply, disposal of waste water from domestic and industrial use and environmental pollution control including sensible use of land, water and air.	2 M
2	**Attempt any four**	4x4 =16
a)	**Criteria for selection of Construction material by civil engineer**	
	i) Load taking capacity or design load ii) Serviceability of material iii) Aesthetically pleasing iv) Economy and availability of material v) Environmental friendly material	ANY FOUR POINTS 1 X 4 = 4 M
	Note: Only Point if written ½ mark each and respective explanation ½ mark	

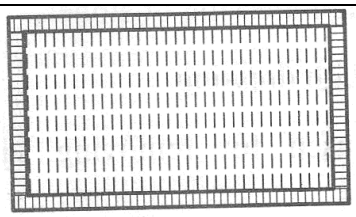
Q.No.	Answer	Marks
b)	Role of building construction in civil engineering Building Construction is described as the commercial activity including the creation, modification, renovation and destruction of building and structures Civil engineers visit field for surveying, site investigation or construction inspection or supervision They are also involved in laboratory testing for condition of soil and construction material Civil engineers are involved in the planning, design, construction and maintenance of building Their work is not limited to planning and designing, they also prepare property description, deed, final cost estimates.	4 M
c)	Quarrying of stone: The process of removing the stone from the natural rock bed is called as quarrying of stone. Methods of quarrying i) Digging ii) Heating iii) Wedging iv) Blasting **Note:** Only Point if written ½ mark each and respective explanation ½ mark	1 M ANY THREE POINTS 1 X 3 = 3 M
d)	Timber : The different components of the cross-section should be shown in fig. i) Outer bark ii) Inner bark iii) Cambium layer iv) Sap wood v) Heart wood vi) Medullary rays vii) Pith or medulla. Properties of heart wood i) Strength 	Fig. 2 M ANY FOUR POINTS ½ X 4 = 2 M

Q.No.	Answer	Marks
	ii) Fire resistance iii) Durability iv) Weather resistance v) Elasticity vi) Toughness and abrasion vii) Workability viii) Physical properties like, pleasant appearance, dark colour, straight fibers, etc ix) Hardness	
e)	**Bituminous Materials:** The substance which primarily consist of bitumen or contain a large proportion of bitumen are known as bituminous materials. i) Bitumen ii) Asphalt iii) Tar iv) Emulsion v) Cutback vi) Road oil vii) Primers viii) Water proofing materials based on bitumens and tar binders Explanation of any one point with definition and properties	ANY FOUR POINTS ½ X 4 = 2 M 2 M
f)	**Neat sketches should be drawn with proper patterns**  Hammer Dressing  Chisel Dressing  Pitched face dressing	ANY FOUR POINTS 1 X 4 = 4 M

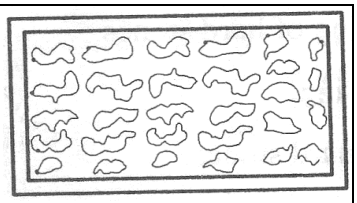
Q.No.	Answer	Marks



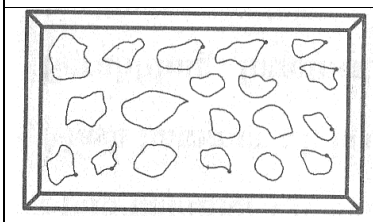
Rough tooled dressing



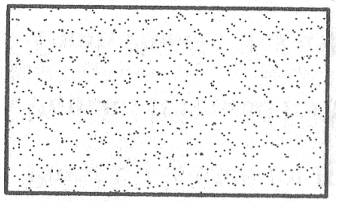
Punched dressing



Vermiculated dressing



Reticulated dressing



Picked dressing

3 **Attempt any four** — 4x4 =16

a) The procedure for manufacturing of lime is basically divided in three steps

i) Collection of limestone or kankar — 1 M

ii) Calcinations of limestone or kankar — 1 M

a) Clamps
b) Intermittent kilns
c) Continuous kilns

Any one process — 1 M

iii) Slaking and grinding of burnt lime or kankar — 1 M

Note: Only Point if written ½ mark each and respective explanation ½ mark

b) **Soil :** Mixture of mineral and rock, derived from chemical and mechanical weathering of rock. **OR** The upper surface of earth or the earth crust containing loose material, with anyone or mixture of clays and gravel, pebbles etc. **OR** Part of earth surface which supports, sustains and nourishes plants. — 1 M

Suitability of:

Sand : for making mortar and concrete and used in finishing works etc. — 1 M

Silt : for foundation but required compaction due to its low cohesion etc. — 1 M

Clay : for embankment fills, retaining pond beds etc. — 1 M

Q.No.	Answer	Marks
c)	Procedure for field slacking of lime for plaster or white-washing When three parts of quicklime is mixed with one part of water, it absorbs water, and soon begins to burst and swell with evolution of heat which brings the entire mass to boil by a hissing sound and is crumbled, to an excessively fine, dry white powder. This effect is due to chemical reaction between lime and water. The resulting product is a suspension of finely divided calcium hydroxide in water which is known as 'slaked lime' On cooling, the slaked lime, in the form of semi-fluid mass stiffens and its use become valuable in masonry work because of its high degree of plasticity or workability it impart to the mortar.	4 M
d)	Constituent of brick clay i) Useful constituents Alumina Silica Lime Iron oxide Magnesia Potash and soda ii) Harmful constituents Lime stone and kankar Nodules Alkalis Iron pyrites Pebbles of stone and gravel Organic matter or vegetation	2 M for any four points 2 M for any four points
e)	Field test on bricks • Strength and durability or crushing strength • Shape and size or dimensional stability • Colour test • Soundness test	ANY FOUR

Q.No.	Answer	Marks
	• Hardness test • Water absorption test • Porosity • Efflorescence test • Impact test **Note:** Only Point if written ½ mark each and respective explanation ½ mark	POINTS 1 X 4 = 4 M
f)	Importance of flooring tiles in building : • They provide hard and plane surface. • They act as a damp proofing and water proofing material • They are scratch proof and stain proof so easy to maintain • They are anti-slip so provide stable workable space etc	Any 2 points ½ X 2 = 1 M
	Name of Flooring tiles • Burnt clay tiles • Ceramic tiles • Mosaic tiles • Concrete tiles • Plastic tiles • Terrazo tiles • Glass tiles • Glazed tiles	Any 2 points ½ X 2 = 1 M
	Importance of Roofing tiles in building : • They provide covering top of building • They act as a water proofing material in rainy season • They are scratch proof and stain proof so easy to maintain • They are available in many variants so increase the appearance of building. Etc	Any 2 points ½ X 2 = 1 M
	Name of flooring tiles. • Manglore tiles • Allahabad tiles • Ranigunj tiles • Country roofing tiles etc	Any 2 points ½ X 2 = 1 M

Q.No.	Answer	Marks
Q.4	**Attempt any Four**	
a)	**Properties of Glass:**	
	1. Glass is hard weather resistant and brittle material.	1 Mark each (Any Four)
	2. Glass is unaffected by atmosphere.	
	3. It has good sound insulation property.	
	4. Glass tends to absorb infra-red radiation so that corresponding heat transmission reduces.	
	5. It has good thermal resistant property as it restricts the flow of heat.	
b)	1. **Making Panel Walls or Partition Walls** :- Chipped and ground Glass	1 Mark
	2. **Sky Light of Roof**: - Rolled Figured Glass or Clear Window Glass	1 Mark
	3. **Jewellery Store or Cashier Booth**:- Polished Plate Glass.	1 Mark
	4:- **Laboratory Apparatus**:- Moulded Glass	1 Mark
c)	Common Field Test on Cement with Respect to:	1 Mark
	1**. Lumps**:- Cement should be free from lumps.	1 Mark
	2. **Colour:**- Cement should be gray in colour.	1 Mark
	3. **Hand Feeling:** - Whenever hand is inserted in cement bag it should feel cool.	1 Mark
	4. **Water Float**: - Cement should float on water.	
d)	**Define: -** Granular mineral material (such as sand, gravel, crushed stone) used with a bonding medium (such as cement or clay) to make concrete, plaster, or terrazzo mixture.	2 (Marks)
	Property of fine aggregate :-	
	1. Aggregates should be well graded	½ Mark (Any Two)
	2. Silt content should not be more than 5%	
	3. Percentage of bulking should not be more than 20%.	
	Property of Coarse aggregate:-	
	1 the size of coarse aggregate should be from 4.75 to 80mm	½ Mark (Any Two)
	2. the surface texture of aggregate should be smooth or rough.	
	3. Water Absorption should be as low as possible.	

e)	**Artificial Timber based product:-** **Plywood**:- 1) Plywood are formed by gluing together thin sheet of odd number veneers. 2) These sheets are placed in such a way that grains of one layer are at right angle to each other. 3) The outer plies are decorative in nature and are called face plies and the inner ones are called cross bands. 4) Arranging plies in layers which are right angled to one another advantages such as strength of sheet in both directions is same and shrinkage is less. 5) Plywood is light weight. 6) It is resistant to cracking 7) It is available in many sizes. 8) Movement due to change in moisture is negligible. **Particle Boards:-** 1. They are obtained from low grade wood are randomly mixed with strong adhesives and are compressed together under high pressure to form particle board. 2. Particle board is much weaker than plywood, because adhesive joint between the individual chips involve end grain surface. 3. In particle board movement is randomly oriented in all direction and restraint is dependent on strength and concentration of adhesives. 4. Properties of particle board depend upon adhesives and particle shape.	2 Marks (Any Four Points) 2 Marks

f)

Artificial Sand	Natural Sand
1. Strength of concrete increases by using artificial sand than by using natural sand.	1. Strength of concrete is less than artificial sand.
2. Artificial sand does not contain any silt contain.	2 As they are obtained from river bed high percentage of Silt is obtained.
3. Use of artificial sand does not affects environment.	3 Use of natural affects Environment.
4. Sieving is not required in case of artificial sand.	4 Sieving is required in case of Natural sand.
5. Washing is not required for artificial sand thus saves labour cost.	5 As they are obtained from river bed hence washing is required thus increases the Labour cost.

1 Mark Each (Any Four)

Q.5 **Attempt any Four**

a)

1. Steel Fibre
2. Synthetic Fibre
3. Polypropylene Fibres
4. Structural Synthetic Fibre

2 Marks

Application:-

1. **Steel Fibre** :- Used for Industrial Floor & Pavements
2. **Synthetic Fibre**:- Used concrete ground floor-slabs
3. **Polypropylene Fibres** :- Used in Concrete Operation
4. **Structural Synthetic Fibre:-** Used for manufacturing of Pipes.

2 Marks

b)	**Properties of Ceramic Materials :**	
	1. Ceramic Material should be uniform in shape and size.	2
	2. They should be free from cracks and other impurities.	Marks
	3. Ceramic material should possess high strength.	(Any
	4. Ceramic material should possess good weather resisting property.	Four)
	5. Ceramic material should possess uniform texture.	
	6. Ceramic material are solid and inert.	
	7. Ceramic material are weak in shearing.	
	Uses of Ceramic Material:	2
	1. They can be used for flooring.	Marks
	2. They can be used for decorative purpose in the interior parts of building.	
	3. They are used in medical labs for making artificial teeth.	
	4. They are used in preparing artificial moulds.	
c)	1. **Water Leakages in Slab**: - Injection Sealing or Grouting.	
	2. **Building to save from white ants**:- Use of Insect Pests.	1 Mark
	3. **To reduce unwanted heat**:-To use Reflective Glass	Each.
	4. **To reduce noise in particular area**:- Sound Absorbing Material	
d)	**Needs of Termite Proofing :-**	
	1. Foundation will not get damaged.	2
	2. Furniture will not get damaged.	Marks
	3. Doors and windows will not get affected.	
	4. Concrete will not get damaged.	
	Need of Sound Insulating Material:	
	1. It absorbs sound up to certain limit in required areas.	
	2. Sound insulation is carried out to minimize the indoor/outdoor noise.	2
	3. It reduces the echoes inside the room.	Marks
	4. It reduces the reverberation of sound.	

e)	**Thermal Insulating Material:-** 1. The thermal insulating material is used to conserve a constant heat or temperature inside the building, irrespective of the temperature changes outside. 2. The exchange of heat is controlled by using thermal insulating material. **Properties of Good Thermal Insulating Material:** 1. Thermal Insulating Material keeps the room cool in summer and warm in winter. 2. Thermal Insulating material prevents the condensation on interior walls, ceilings, windows etc. 3. Thermal Insulating material prevents freezing of water in pipes during winter. 4. Thermal Insulating material prevents heat loss in case of hot water system during summer.	2 Marks 2 Marks
f)	**Properties of Geo Synthetic Material :-** 1. Geo synthetic material provides erosion control. 2. Geo grids are either stretched in one or two directions for improved physical properties. 3. Geo nets are used in drainage area where they are used to convey liquids of all types. 4. Geo Membrane provides liquid barrier and vapour barrier. **Uses of Geo-Synthetic Material:-** 1. They are used to improve property of soil. 2. They are used to reduce lateral movement of soil particle in foundation. 3. They are used to control water pressure in soil. 4. Geo Synthetic materials are used to retained earth walls and steep soil slopes	2 Marks 2 Marks

Q6.	**Attempt any Four**	
a)	**Ingredients of Good Mortar:-**	
	1. Clean and dry sand should be used.	2
	2. Cement should be free from lumps.	Marks
	3. Sand be sieved properly and then should be used whenever required.	
	4. Water cement ratio should be maintained.	
	5. Aggregates of required size and shape should be used.	
	Deciding the quality of good Mortar:-	
	1. It should have uniform colour.	
	2. It should give homogenous mix.	2
	3. Segregation should not be observed.	Marks
	4. Bleeding should be observed.	
b)	**Define :-**	
	1. A white powder that sets to a hard solid when mixed with water, used for making sculptures and casts, as an additive for lime plasters, and for making casts for setting broken limbs.	2 Marks
	Properties of Plaster of Paris:-	
	1. Whenever water is added in plaster it sets immediately.	
	2. It makes the surface smooth.	2
	3. It is water resistant.	Marks
	4. It can be moulded in any desire shape and size.	
c)	1. **To give brilliant silvery shining**:- Aluminium Paint.	1 Mark
	2. **External Plastered Brick Work:**- Cement Paint.	Each
	3. **Show rooms & Offices**:- Plastic Paints.	
	4. **Wooden Surfaces:-** Turpentine Varnishes.	

d)	**Agro & Industrial Waste as a Construction Material**: 1. It can be used in manufacturing of bricks. 2. It can be used in making bio- fuel & Paper. 3. It can be used in generation of steam energy and electricity generation. 4. It can be used for renewable energy sources. 5. It can be used for binding clay and concrete. 6. It can be used for stabilization of soft soil. 7. It can be used as an aggregate substitute material. 8. It can be used for road sub base construction.	1 Mark Each (Any Four)
e)	**Application of construction waste:-** 1. They are used for Pavement filling. 2. They are used for Plinth filling. 3. They can be use as low grade fresh concrete 4. Use such concrete in casting conventional type of bricks and using them in place of burnt clay bricks. 5. Highway construction for casting curve, chute drain, median drain and side drain components of highway 6. Making benches for park and pedestrian paths etc.	4 Marks (Any Four)
f)	**What is Fly Ash:-** 1. Fly ash is the finely divided residue that results from the combustion of pulverized coal and is transported from the combustion chamber by exhaust gases 2. Fly ash is produced by coal-fired electric and steam generating plants. 3. Typically, coal is pulverized and blown with air into the boiler's combustion chamber where it immediately ignites, generating heat and producing a molten mineral residue. Boiler tubes extract heat from the boiler, cooling the flue gas and causing the molten mineral residue to harden and form ash.	2 Marks

	Properties of Fly Ash:- 1. **Fineness:** The fineness of fly ash is important because it affects the rate of pozzolanic activity and the workability of the concrete. 2. **Specific gravity:** Although specific gravity does not directly affect concrete quality, it has value in identifying changes in other fly ash characteristics. 3. **Chemical composition:** The reactive aluminosilicate and calcium aluminosilicate components of fly ash are routinely represented in their oxide nomenclatures such as silicon dioxide, aluminium oxide and calcium oxide. 4. **Carbon content:-** It can range up to five percent per AASHTO and six percent per ASTM. The unburned carbon can absorb air entraining admixtures (AEAs) and increase water requirements	2 Marks

Note for Examiner: In the above answers if students are writing some additional points or information which may be correct but not included in the model answer sheet. Examiners are requested to go through each answer carefully.