Important Instruction to Examiners:-

1) The answers should be examined by key words & not as word to word as given in the model answers scheme.

2) The model answers & answers written by the candidate may vary but the examiner may try to access the understanding level of the candidate.

3) The language errors such as grammatical, spelling errors should not be given more importance.

4) While assessing figures, examiners, may give credit for principle components indicated in the figure. The figures drawn by candidate & model answer may vary. The examiner may give credit for any equivalent figure drawn.

5) Credit may be given step wise for numerical problems. In some cases, the assumed contact values may vary and there may be some difference in the candidate's answers 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 programme based on equivalent concept.

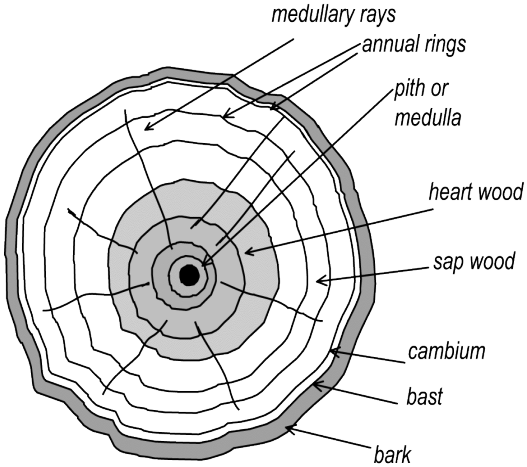
Important notes to examiner

Q .NO	SOLUTION	MARKS
Q No.1	**Attempt Any Ten of the following:**	**20 M**
a)	**State the role of Environmental Engg. in human life.**	**02 M**
	1) Water supply and water treatment plant units design and construction. 2) Sanitary engineering and sanitary units design and construction. 3) Pollution control of air, water, land and noise.	**01 M each**
b)	**State different types of construction materials.**	**02 M**
	Materials can be classified into following types: 1) Natural materials 2) Artificial materials 3) Special materials 4) Finishing materials 5) Recycled materials	**½ M each**
c)	**State any two defects occur in Timber.**	**02 M**
	1) Defects due to natural forces: a) Knots b) Shakes c) Wind cracks d) Upsets e) Twisted fibers f) Rindgall g) Checks h) Rupture **2) Defects due to conversion:** a) Radial shakes b) Case hardening c) Twisting and bowing d) Honeycombing **3) Defects due to fungi**: fungi cause rotting of wood and stains on wood. **Defects due to insects**: beetles, marine borers, termites, eat wood and weaken wood. **4) Defects due to conversion:** e) Radial shakes f) Case hardening g) Twisting and bowing h) Honeycombing **5) Defects due to fungi**: fungi cause rotting of wood and stains on wood. **Defects due to insects**: beetles, marine borers, termites, eat wood and weaken wood.	**1M Each Defects**
d)	**Distinguish between stone and rock.**	**02 M**
	1) A rock is solid portion of Earth's crust which is formed by eruption of lava /magma or by sedimentation process and the portion of rock quarried from quarry is called stone. 2) Rock is in the form of bed and stone is in the form blocks or slabs.	**02 M**
e)	**State any two applications of Construction Management.**	**02 M**
	1) Construction management is total planning, coordination and control of project from beginning to completion according to client's requirement. 2) It is management of labour, material and equipments at economical cost and without delay in project. 3) Project objectives and plans are specified including scope, budget, schedule, performance, requirement and selected project partners.	**01 M each**

Q .NO	SOLUTION	MARKS
f)	**State detailed classification of cement.**	**02M**
	Cement can be classified as 1. Acid Resisting Cement 2. Coloured Cement 3. Sulphate Resisting Cement 4.White Cement 5. Rapid Hardening Cement 6. Ordinary Portland Cement (OPC) 7. Pozzolana Portland Cement (PPC) 8. High Alumina Cement 9. Low Heat Cement 10. Quick Setting Cement 11. Water Proofing Cement	**½ M Each**
g)	**Define particle board and veneers.**	**02 M**
	• Particle board is manufactured using chips or particles of low grade wood or sawdust mixed with strong adhesive and then compressed together under high pressure. • Veneers are thin sheets of wood or slices of wood of superior quality obtained by rotating a log a wood against a sharp cutter or saw. The thickness of veneers varies from 0.4mm to 0.6mm or more.	**02 M**
h)	**List any two types of Fibers.**	**02 M**
	1) Steel fibers 2) Carbon fibers 3) Glass fibers 4) Plastic fibers 5) Asbestos fibers 6) Jute fibers 7) Coir fibers	**1M each Write any TWO**
i)	**Mention any two uses of termite proofing materials.**	**02 M**
	1) Termite proofing materials are useful for prevention or control of growth of dry wood termites which damage wooden furniture and other wooden objects in a building. 2) They are useful for prevention and control of sub-terrain termites which are mainly responsible for causing damage to foundation and plinth of buildings.	**02 M**

j)	**State any two names of thermal insulating materials.**	**02 M**
	Thermal insulating materials are: 1) Rock wool 2) Thermocol 3) Aerated concrete 4) Fibre board 5) Reflecting paint 6) Cavity wall 7) Aluminium foil 8) Expanded blast furnace slag 9) Foam plastic 10) Cork 11) Glass wool 12) Gypsum board	**½ M Each**
k)	**State any four characteristics of good tiles.**	**02 M**
	Characteristics of good tiles: ➢ It should be free from defects like cracks and impurities. ➢ It should be regular in shape and size ➢ It should be sound, hard and durable. ➢ It should have uniform texture and colour. ➢ It should have low water absorption i.e. less 15%. ➢ It should have sufficient resistance to atmosphere and dampness. ➢ It should have pleasing appearance. ➢ It should be leak proof. ➢ It should have sufficient capacity to resist the load.	**½ M each Write any Four**
l)	**Mention chemical and mechanical properties of blast furnace slag.**	**02 M**
	Chemical Property of Blast Furnace Slag:- a) It is mildly alkaline having pH value from 8 to 10. b) It contains small amount of sulphur but it does not pose a corrosion risk to steel Piling or steel embedded in concrete made with blast furnace slag. **Mechanical Property of Blast Furnace Slag: -** a)As the blast furnace slag has good abrasion resistance, good soundness characteristic it is used as an aggregate material. b) It has high insulating value and high water absorption value.	**01M Each**

Q No.2	Attempt ANY FOUR of the following.	16 M
a)	**State any four criteria for selection of construction material.**	
	1) **Load taking capacity or design load**:- Material must be selected for their ability to support the loads imposed on them. 2) **Serviceability of material**:- The material selected should be useful till the life of the structure. 3) **Aesthetically pleasing**:- Material selected should increase appearance of structure. 4) **Economy and availability of material**:- Material to be selected should be economical for purchase, maintenance, replacement, demolition and disposal. It should be easily available. 5) **Environmental friendly material**:- Material selected should not be harmful to environment and occupants of structure.	**1 each Write any four**
b)	**State any four roles of civil engineering in human life.**	**04 M**
	1) Civil engineering is very important at the starting of work as surveying is done to start the work. **2)** Estimation and valuation is also carried during work progress and after completion respectively. **3)** Civil engineering is important for mechanical engineers to provide proper foundation for machines and electrical engineers for providing electrical poles. **4)** Transportation facilities like roads and railways are possible only because of civil engineering. **5)** Construction of dams, harbours, airports etc. is civil engineering activity. **6)** Water supply and drainage facility also comes under civil engineering. This way civil engineering is important in human life.	**04 M**
c)	**List the requirements of good building stone.**	**04 M**
	1) It should have high crushing strength more than 100 N/mm2. 2) It should have high durability. 3) Water absorption should be less than 0.6% by weight after 24 hours. 4) It should be easy for cutting and dressing. 5) It should have good fire resistance. 6) Specific gravity should be more than 2.7. 7) It should be economical and easily available. 8) It should have good weathering resistance. 9) It should have high impact value and high toughness index. 10) The stone should have fine compact texture and light color as dark color may fade in due course of time. It should have pleasing appearance and should retain its colour for longer time. 11) It should be free from cavities, cracks and patches of loose and soft materials. Stratifications should not be visible to naked eye. 12) The stone should be strong and durable. Compressive strength should be 60-200 N/mm2. 13) Weight is indication of porosity and density. For dams and retaining walls heavy stones are used and for arches and domes light stones are used. 14) Hardness property is important for floors, pavements and bridges. It is resistance to scratching. Hardness should be more than 14. 15) The stone should be well seasoned.	**½ M For Each Write Any Eight**

d)	**What is meant by quarrying of stone and state different methods of quarrying from bedrock?**	**04 M**
	The process of taking out stones from natural rock beds is known as quarrying of Stones. Methods of Quarrying of Stones: - ➢ Digging –Small and soft stones are removed by digging with pick-axe, hammers, crowbars etc. ➢ Heating –From horizontal and thin rock bed, stones are removed by heating top or intermediate layers. ➢ Wedging – When rock bed consists of natural fissures or cracks wedging method is used. Sometimes artificial holes are drilled for wedging. ➢ Blasting- this method is used for hard fissure less rocks using explosives.	**1M Each**
e)	**Define bitumen. State any two properties and two uses of it.**	**04 M**
	Bitumen is a non-crystalline solid or viscous material derived from petroleum, by natural or refinery process. It is black or brown in colour and it is soluble in carbon disulphide. It is asphalt in solid state and mineral tar in semi fluid state. **Properties-** 1) It is black or brownish-black in colour. 2) It is completely soluble in carbon disulphide. 3) When heated, it melts and gives distinctive odour. 4) It has adhesive property when comes in contact with heat. 5) It is mostly solid or semi-solid in state. **Uses-** 1) It can be used as stabilizing agent. 2) It is used in roofing and damp-proofing felts. 3) It is used in manufacture of pipe asphalts and joint fillers. 4) It is used in filling cracks in masonry structure for stopping leakage. 5) It is used in construction of road pavement.	**01 M** **½ M each Write Any Three** **½ M each Write Any Three**
f)	**Draw a neat labeled sketch of structure of timber and state the properties of heart wood.**	**04M**
	 *The tree trunk showing growth rings* **Properties of heart wood-** 1) It is dead, inner wood and generally dark in colour. 2) It does not take part in growth of tree. 3) It provides rigidity to the tree. 4) It is mechanically strong, resistant to decay and less easily penetrated by wood preservative chemicals.	**02 M For Fig.** **1 M Each**

Q No.2	Attempt ANY FOUR of the following.	16 M
a)	**Give the procedure of field slaking of lime for plaster or white washing.**	4 M
	i) When lime is added to water in process called "slaking'' calcium hydroxide traditionally called slacked lime ii) Quick lime heaped on a masonry or wooden platform ii) Water is gradually sprinkled over it till lime is slaked and reduce to powder form iv) During sprinkling of water, the heap is turned over and over again till no more water is to be added then require for the lime to convert in to the powder form v) The slaked lime is then screened through IS sieve 3.35 mm and the residue if any is rejected vi) The final product is slaked lime. vii) The chemical formula is $Ca(OH)_2$	4 M
b)	**What is meant by soil? State the suitability of sand, silt and clay in construction work.**	4M
	Definition of Soil : **As Per I.S. 2809-1972:** Soil is sediment or other unconsolidated accumulation of solid particles produced by physical and chemical disintegration of rock. **OR** **As per Layman's Definition:** The upper surface of earth or the earth crust containing loose material, with anyone or mixture of clays and gravel pebbles etc. **OR** **As per Agriculturists Definition:** Part of the earth surface which supports, sustains and nourishes plants.	**1M for Definition (any ONE)**
	Suitability of Sand : i) For making mortar ii) For making concrete	**1 M (any ONE)**
	Suitability of Silt: i) Silt is suitable for foundation.	**1 M**
	Suitability of Clay: i) Clay is suitable in embankment fills of dam. ii) Suitable for retaining pond beds. iii) Also for foundation. **Note-: Student may write any other suitability point than above mentioned. So accordingly credit to be given**	**1 M (any ONE)**

c)	**Enlist the different types of tar. State any two properties and uses of it.**	**4 M**
	Types of Tar: **1) Coal tar** **2) Wood tar** **3) Mineral tar** **Properties:** i) It is deep black in colour. ii) It contains more carbon content. iii) It has high viscosity. iv) It swells more fluid when heated. **Uses:** i) For surface painting under exceptionally cold weather conditions and on hill roads. ii) Standard surface painting under normal Indian climatic condition. iii) Surface paintings, renewal coats, premixing chips for top course. iv) Premixing tar macadam in base course. v) For grouting.	**2 M** **½M for each (Write any Two points)** **½M for each (Write any Two uses)**
d)	**State any four common field tests on bricks.**	**4M**
	1) Strength and durability or crushing strength. 2) Shape and size or dimensional stability. 3) Colour test 4) Soundness test. 5) Hardness test. 6) Water absorption test. 7) Porosity. 8) Efflorescence test. 9) Impact test.	**1 M for each (Write any Four)**
e)	**Give the importance of flooring tiles and roofing tiles in building and give two names of it.**	**4M**
	Importance of flooring tiles and roofing tiles: i) Gives good appearance or attractive look. ii) Easy to clean iii) These are cost effective iv) Longer life span v) They do not require polishing. **Names of Flooring Tiles:** 1) Vitrified Tiles 2) Granomite Tiles 3)MarboniteTiles 4) Glazed Tiles 5) Spartex Tiles **Names of Flooring Tiles:** 1) Allahabad Tiles 2) Corrugated Tiles 3) Guna Tiles 4) Manglore Tiles 5) Flemish Tiles 6) Ranigunj Tiles 7) Country Tiles	**1 M for each (Write any Two)** **½M for each (Write any Two)** **½M for each (Write any Two)**

f) Define wall cladding. State two merits and demerits of it. — 4M

Definition of Wall Cladding: — **1 M**

Wall Cladding or tiling is a process of finishing the surface with tiles.

Merits : — **½M for each (Write any Two)**

i) It protects the exterior surface of building from atmospheric agents
ii) It gives pleasant and decorative appearance to the surface
iii) They make wall non-absorbent, sound proof.
iv) Due to wall cladding, walls are easy to clean.

Demerits: — **½M for each (Write any Two)**

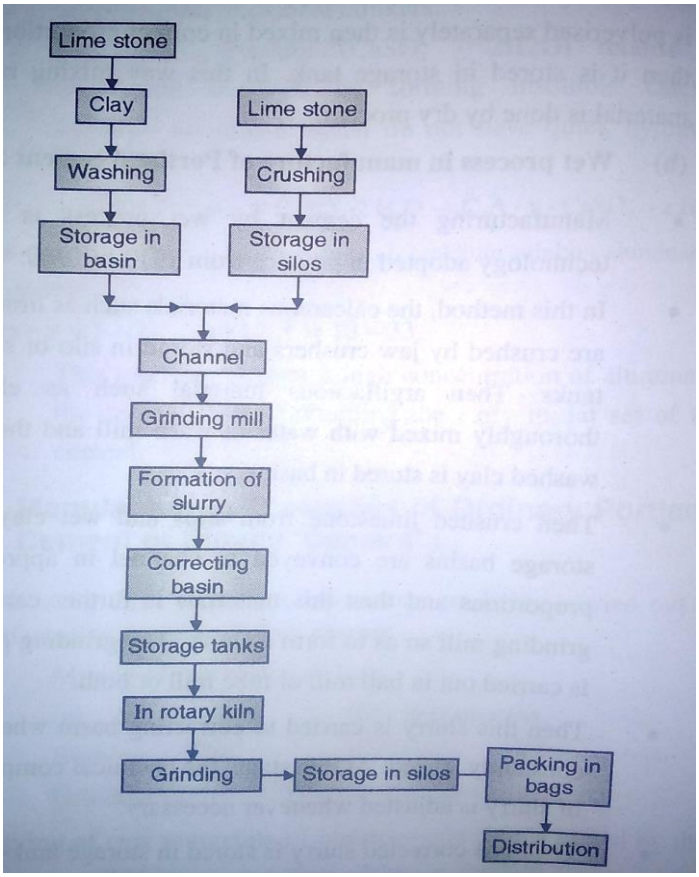
i) Cladding can be very expensive, depending upon the material.
ii) Depending upon size of the structure, installation of sliding is time consuming.
iii) It require simple wash but on regular basis.
iv) If it is broken or dented, its aesthetic qualities are reduced of structure.
v) Sometimes it may difficult to repair and maintenance.
vi) If cladding is not properly installed, the underlying structure can be damaged.

Q No.4 Attempt ANY FOUR of the following. — 16 M

a) State any four types of glass with its suitability. — 4 M

1 M for each (any Four)

Sr. No.	Type of Glass	Suitability
1	**Soda-lime or Crown Glass**	For making Window panes, glass tubes, simple glass, electric bulbs, bottles etc.
2	**Potash-Lead of Flint Glass**	For making lenses, radio valves, table ware
3	**Bottle or Common Glass**	For making Medicine bottles
4	**Potash-Lime Glass**	For making Combustion tubes
5	**Boro-silicate or Pyrex Glass**	For making high quality laboratory equipment's and cooking utensils.
6	**Structural Glass**	For making panel walls, partition wall, facing daylight opening, stair way enclosures
7	**Flat Draw sheet Glass**	For all type of engineering works
8	**Fibre Glass**	Suitable in air filters
9	**Wired Glass**	For skylights & roof, also due to to fire resistant property suitable in doors and window.
10	**Foam Glass**	Suitable in Air-conditioning and refrigeration industries
11	**Shielding Glass**	Suitable for radiation in windows
12	**Bullet-Proof Glass**	Suitable for protection in jewelry stores, glazing bank teller, cashier booths
13	**Tinted Glass**	Suitable only for decoration and
14	**Glass Blocks**	Suitable for partition and for insulation

b)	**What is meant by particle board? State any two properties and uses of it.**	**4M**
	Particle Board : The chips or particles of low grade wood, smaller logs obtained from top of trees are randomly mixed with strong adhesive and then compressed together under high pressure to form **Particle Board.** **Properties of particle board:** i) These boards provide dimensional stability. ii) They have reasonable strength. iii) It gives smooth uniform surface and no difficulty in nailing. iv) They have high density. **Uses of particle board:** i) For making notice board in schools, colleges, offices etc. ii) For making low grade furniture. iii) It is commonly for making the top of steel tables.	**1 M** **½M for each (Write any Two)** **½M for each (Write any Two)**
c)	**Draw a flow diagram of wet process of manufacturing of cement.**	**4M**
	 **Flow Diagram of Wet Process**	**4 M**

d)	**Define artificial sand with its suitability.**	**4M**
	Definition of Artificial Sand: The sand which is obtained from stone crusher after crushing the natural stone. **Suitability of Artificial Sand:** i) Artificial sand is easily available from any nearby source of stone crusher hence can be used in construction. ii) It is completely free from mud & any other impurities. iii) The artificial sand particles are uniformly graded. iv) There is less bulking of sand	**2M for definition** **1M for each (any Two)**
e)	**What are the different properties of glass?**	**4M**
	1. Viscosity:the viscosity of glass changes continuously with temperature without a critical point. **2. Thermal expansion:**coefficient of expansion mainly depends on the composition of glass. **3. Thermal conductivity.** **4. Optical properties.**	**1M** **1 M** **1M** **1M**
f)	**Give two advantages and two disadvantages for precast concrete products andwrite any two properties of it.**	**4M**
	Advantages of precast concrete products: 1. The concrete of superior quality is produced by strict quality control. 2. It is not necessary to provide joints in the pre-cast construction. **Disadvantages of precast concrete products:** 1. If not properly handled, the pre-cast concrete may be damaged during transport. 2. It becomes difficult to produce satisfactory connections between the pre-castmembers. **Properties of precast concrete product:-** i) Precast concrete offers durable, flexible solution for floors and walls. ii) It has good appearance i.e. and almost end variety shapes, colours, texture andfinishes is available for precast concrete iii) It is high sound insulation iv) It is high thermal insulation v) It has good fire resistance properties	**½M for each** **½M for each** **1 M for each (any TWO)**

Q .NO	SOLUTION	MARKS
Q No.5	**Attempt Any four of the following:**	16 M
a)	**Write any two properties and uses of glass fibres**	04 M
	Properties of glass fibres:(any 2) 1) High tensile strength 2) High heat resistance 3) Non combustibility 4) Low cost 5) Excellent moisture resistances 6) High heat resistance 7) High young modulus 8) High dimensional stability **Uses of glass fibre:** 1) For purpose of heat insulation glass wool is generally used 2) Fibre glass reinforced plastic can widely be used in the construction of furniture, bathroom fitting, lamp shade etc.	½ M Each Write Any Four 1 M each
b)	**What is fibre? write any two examples where different types of fibres used**	04 M
	Fibre: Fibre is a class of materials that are continuous filaments or are in discrete elongated pieces, similar to length of thread. **Examples where fibres are used : (any 2)** 1) Used in construction 2) Commonly used in building wiring 3) Manufacturing of furnitures 4) Extensively used in medical and automotive industries 5) For manufacturing roofing materials 6) Used for manufacturing pipes	1M 1M each Write Any Three
c)	**What do you mean by geo synthetic material ? Mention applications of it.**	04 M
	Geo systhetic materials: geo synthetics are the polymetric products used to solve civil engineering problems it is made from wide variety of natural and synthetics material. Geo synthetic material are geotextiles, geostrips, geogride, geomembranes, geonet, geocell, geoform etc **Uses of Geosynthetic Material: -** • Geo synthetic are used to improve level grade soil situations such as roads, valley. • They are used to improve slope grade situations such as banks, hill side. • Geosynthetic control water pressure allowing flow in the plane of material such as foundation walls. • Geosynthetic material prevents soil movements	02 M 01 M for Each Applicati on
d)	**State properties and classification of damp proofing materials.**	04 M
	Properties: 1) It should be impervious in nature 2) It should be strong and durable 3) Material must be able to withstand dead as well as live load without damages 4) It should be dimensionally stable 5) It should be free from deliquescent salts like sulphates, chlorides and nitrates	2 M for Any TWO

Q .NO	SOLUTION	MARKS
	Classification of damp proof materials: 1) Flexible material like bitumen felts, plastics sheeting 2) Semi rigid materials like mastic asphalt 3) Rigid material like class bricks stone, slates, cement concrete etc 4) grout materials consist of cement slurry and acrylics based polymers	**2 M for Any TWO**
e)	**Suggest the treatment for following:**	**04 M**
	i) Water leakages in the slabs: **Water Proofing Course** ii) Building to save from white ants: **Termites Proofing Course** iii) To reduce unwanted heat: **Thermal Insulating Materials** iv) To reduce noise in particular area: **Sound Insulating Materials**	**01 M each point**
f)	**List any four properties of thermal insulating materials.**	**04 M**
	Properties of thermal insulating materials: **(any 4)** 1) Thermal insulating should be bio resistant and dry. 2) Thermal resistant should be chemically resistant and fire proof. 3) Thermal resisting material should have bulk density below 600Kg/m^3. 4) Thermal insulating material should have more pores as the entrapped air or any other gases within the pores decreases the thermal conductivity of material. 5) The pores in thermal insulating material should be closed so that water vapor does not enter in the material. 6) With increase in the moisture content in the material, the coefficient of thermal conductivity rises greatly.	**1M each Write any four**

Q No.6	Attempt ANY FOUR of the following.	16 M
a)	**Enlist any four properties of good paint**	04 M
	1) A paint should possess good covering power or spreading power 2) It should have such consistency so that it can be applied easily and freely on the surface 3) It should adhere well to the surface to which it is applied 4) The paint film on drying should be impervious uniform in thickness, smooth, hard and wear resistances. 5) The paints not be affected by weathering agencies 6) Paint colour should neither fade nor change 7) It should offer a surface which is durable and strong enough to resist moisture penetration	**1 each Write any four**
b)	**List four properties of Linoleum.**	04 M
	1) It is a heat insulating material 2) It has resistance Abrasion property 3) It is free from fire hazard 4) It has good water proofing property 5) very durable and flexible	**01 M For each Point**
c)	**What are the ingredients of good mortar and enlist how you decide good mortar**	04 M
	Ingredients of mortar: 1) Cement/lime 2) Sand/sinder/surkhi 3) Water **The mortar is said to good if it possess the following properties:** 1) It should be workable 2) It should be tough, hard durable and economical 3) It should be capable of resisting weathering effect 4) It should be easily transported and placed in site 5) It should set quickly	**1 M** **1 M each Write Any Three**
d)	**What is meant by flyash and state any four properties of fly ash.**	04 M
	Fly ash: fly ash is one of the residues generated in combustion and comprises the fine particles that rise with the gas. It is captured by electrostatics precipitator or other particle filtration equipments. **Properties of fly ash:** 1) fly ash is a heterogeneous material. 2) SiO2, Al2O3, Fe2O3 and occasionally CaO are the main chemical components present in fly ashes 3) fly ash particles are generally spherical in shape and range in size from 0.5 µm to 300 µm 4) fly ash produced from coal combustion was simply entrained in flue gases and dispersed into the atmosphere.	**1M** **1M Each**

e)	**Write any four applications of construction waste.**	**04 M**
	1) Resue of bricks ,stone slab, timber conduct, piping railing ,etc to the extent possible and depending upon their condition 2) Plastics, broken glass, scrap metal etc can be used by recycling industries 3) Large unusual pieces can be sent for filling up low lying areas 4) Fine material,such as sand dust etc can be used as cover material over sanitary landfill 5) Sale/auction of material which cannot be used at the site due to design constraints or changes in design 6) Rubble brick bats, broken plaster/concrete piece etc can be used for building activities such as leveling under coat of lanes where the traffic does not constitute of heavy moving loads	**1M For Each** **Write Any four**
f)	**Write use of Rubber waste, Bagasse rice husk and Coir fibres.**	**04M**
	Uses of Rubber waste: 1) Used for erosion control 2) Manufacturing of floor mats 3) By grinding tyres into crumb and using it in asphalt mix 4) Used ib core of earthen embankments **Uses of Bagasse rice husk:** 1) When bagasse is mixed with lime it acts as chemical stabilizer in compacted soil blocks. 2) When bagasse is mixed with cement, the mortar prepared is good making concrete pavers and roof tiles. 3) Sugarcane bagasse can replace cement in concrete as sugarcane bagasse had excellent binding property. 4) Sugarcane bagasse improves quality of material. **Uses of Coir fibres:** 1) Brown coir is used in floor mats and doormats brushes, mattresses, floor tiles and sacking 2) The major uses of white coir is in rope manufacturing and fishing nets	**½ M** **Write** **ANY** **Three** **½ M** **Write** **ANY** **Three** **1 M**