WINTER–19 EXAMINATION

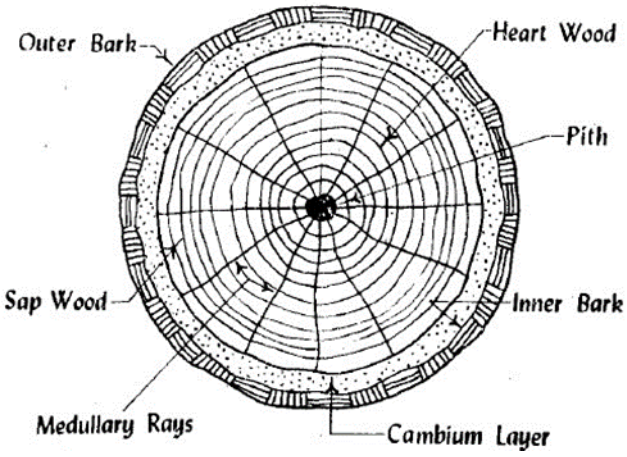
MODEL ANSWER **Subject Code:** **22204**

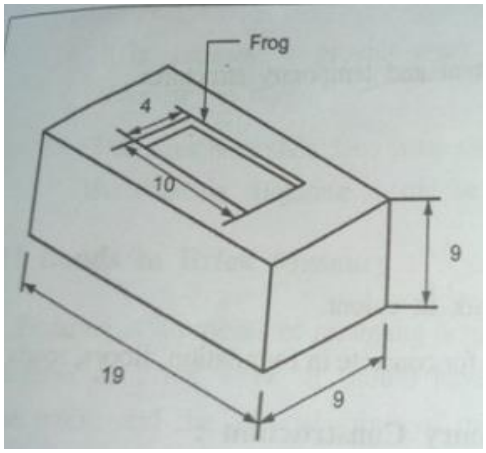
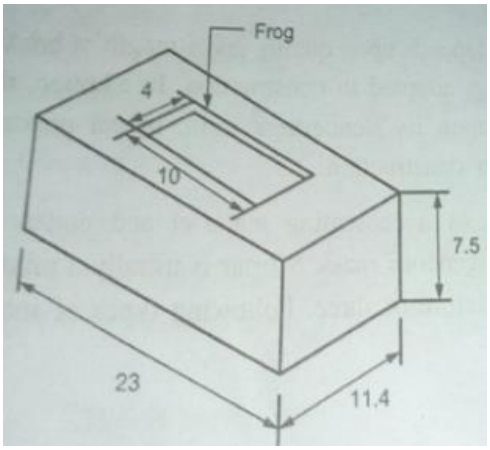
Subject: Construction Materials

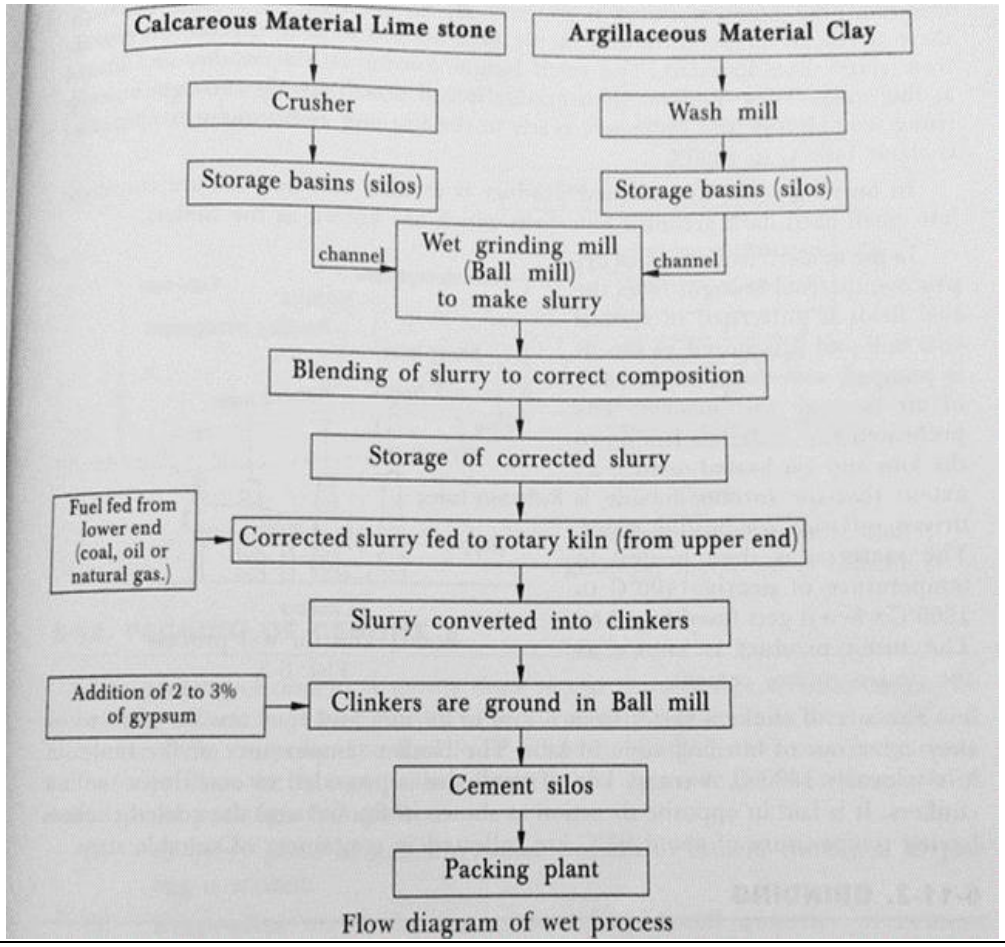
1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors etc… 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 candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant 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 candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

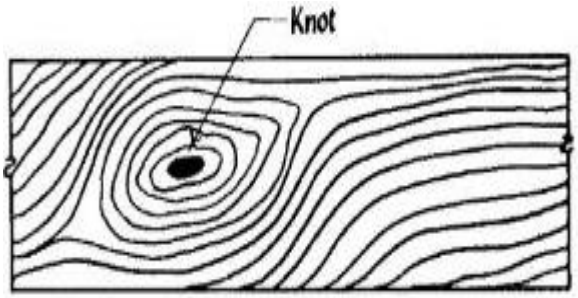
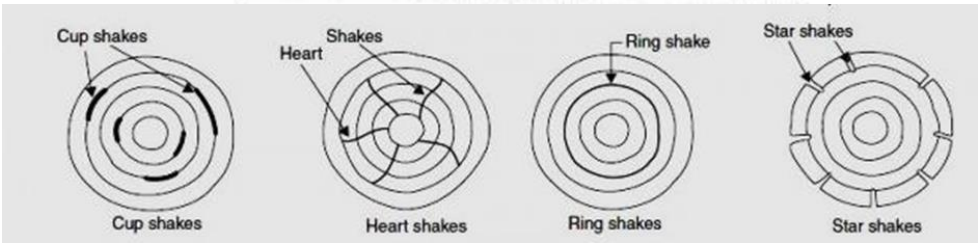
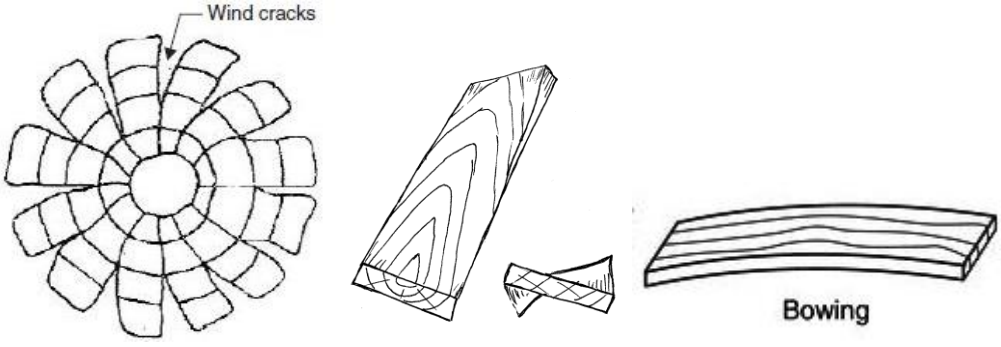
Que. No.	Sub Que.	Answer	Marking Scheme	Total Marks
1		**Attempt any FIVE of the following:**		10
	a) Ans.	**State the role of civil engineering in human life** The Civil Engineering plays an important role in human life in the following ways: 1. Designing and construction of infrastructure 2. Includes roads, bridges, dams, canals, buildings, water supply and other facilities 3. Electricity generation by constructing dams 4. Water supply for drinking, agriculture, waste disposal etc. is also done by civil engineers.	**1 mark each (Any Two)**	2
	b)	**List any four applications of Irrigation engineering** The applications of irrigation engineering are: 1. Construction of dams, canals, spillways etc. 2. Supplying Water for Agriculture, Drinking Etc. 3. Irrigation engineering also deals with the various systems of irrigation such as sprinkler, drip etc. to supply water in farms 4. Ground water storage can also be developed by constructing percolation tank 5. It ensures water supplies during the periods of less rainfall or during summer when water is not available in abundance	**½ mark each (Any Four)**	2

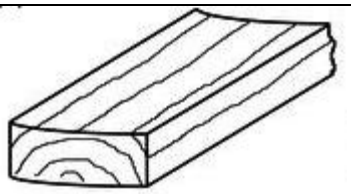
1	c)	**Define quarrying of stone. State any two methods of quarrying** The process of taking out stones from natural rock beds is known as quarrying of Stones. **Methods:** a) Digging b) Heating c) Wedging d) Blasting **(Note: Any two methods to be written)**	**1** **1**	**2**
	d) Ans.	**Enlist any four types of flooring tiles.** **Types of flooring tiles:** Shahabad, Kotah, Ceramic, Granite, Marble, Vitrified, Glazed, Plastic tiles Concrete tiles, Mosaic tiles, Clay tile.	**½ mark each (Any four)**	**2**
	e) Ans.	**Enlist any four types of special bricks** a) Acidic bricks b) Perforated bricks c) Silica bricks d) Colored bricks e) Fire bricks f) Blue bricks g) Fly ash bricks h) Engineering bricks i) Refractory bricks j) Sand lime bricks	**½ mark each (Any four)**	**2**
	f) Ans.	**Define Enamel paint and Plastic paint** **Enamel Paint:** It contains white lead, oil, petroleum, spirit and resinous material. It is used for external and internal walls **Plastic Paint:** It contains the necessary variety of plastics and it is available in market under different trade names. It is used in internal walls	**1** **1**	**2**
	g) Ans.	**Enlist any four properties of ferrocrete** 1. It can be used in construction of roads and walkways. 2. It has higher early strength 3. Quick setting 4. Early demolding, handling and use of precast units 5. More finely grounded than Portland cement 6. Chemically similar to Portland cement 7. Does not contain any added accelerators or admixtures 8. Color similar to OPC. 9. Composite building material made from combination of concrete and iron. 10 It is highly resistant to wear and tear	**½ mark each (Any four)**	**2**
2		**Attempt any THREE of the following:**		**12**
	a) Ans.	**State the role of civil engineer in the field of Environmental Engineering.** **The civil engineer plays an important role in Environmental Engineering in the following ways:** 1. Sensible use of water, land, and air so that the environmental pollution and degradation is minimized	**1 mark each point**	**4**

		2. Engineers study water, soil and other pollution problems and develop solution to solve and control them. 3. Facilities like water supply for drinking, agriculture, ground water quality is developed by civil engineers. 4. Thus it includes planning, designing, construction of water and waste water treatment plants, and disposal of solid waste. **(Note: Any other relevant point should be considered)**		
	b) **Ans.**	**What do you mean by eco-friendly building materials? State any two properties of it.** Eco-friendly means earth-friendly or not harmful to the environment. This term most commonly refers to products that contribute to green living or practices that help conserve resources like water and energy. Eco-friendly products also prevent contribution to air, water and land pollution **Properties of Eco-Friendly Material**: 1. It is bio-degradable. 2. It is renewable source. 3. It is reused & recycled. 4. It increases durability & life span of living bodies. 5. It aids energy efficiency in building. 6. It reduces air pollution, land pollution & water pollution. 7. It is locally available.	**2** **2** **(Any two)**	**4**
2	**c)** **Ans.**	**Draw cross section of timber. Give any four engineering properties of timber.**  **Properties of Timber:** 1. **Appearance:** A Freshly cut timber should have shining appearance 2. **Colour:** The Colour of the timber should be dark. Light colour of timber indicates low strength. 3. **Durability:** A Good timber should be durable. It should be capable of resisting insects and other agencies. It should be long-lasting 4. **Fire resistance:** Timber is a bad conductor of electricity and heat. It should not catch fire easily.	**2** **2** **(Any four)**	**4**

		5. **Smell:** A Good timber should have sweet smell, unpleasant smell indicates decayed timber 6. **Seasoning:** The Timber should be well seasoned 7. **Strength:** A Good Timber should be sufficiently strong and should be capable of taking loads. 8. **Toughness:** It should be capable of resisting shocks 9. **Defect:** Good timber should be free from defects 10. **Texture:** The texture of timber should be even.		
	d) Ans.	**Explain two properties and two uses of sand.** **Properties:** a) It is a naturally occurring granular material composed of finely divided rock and mineral particles. b) It is obtained by dredging of river, hence harmful for the ecosystem. **Uses of sand:** a) Commonly used a building material b) It is mixed with cement and water to make concrete c) Manufacture of bricks d) Used in filtration of water e) Used to make casts.	**2** **2** **(Any two)**	**4**
3		**Attempt any THREE of the following:**		**12**
	a) Ans.	**Draw neat sketches showing all the dimensions of:** **i) Conventional bricks and** **ii) Standard bricks**  **Standard Brick**  **Conventional Brick**	**2 marks for sketch** **2 marks for dimensions**	**4**

3	b) Ans.	**Draw flow chart showing various stages in wet process of manufacturing of cement**  Flow diagram of wet process	4	4
	c) Ans.	**Suggest the type of glass used for the following work:** **i) Making panel of partition wall** **ii) Cashier Cabin** **iii) Skylight** **iv) Door Shutter** **i) Making panel of partition wall:** Block glass OR Sheet Glass OR chipped and ground glass OR soda lime glass **ii) Cashier Cabin-**Polished plate glass OR bullet proof glass OR soda lime glass OR laminated glass **iii) Skylight:** Wired glass OR rolled figured glass OR clear window glass or lead glass **iv) Door Shutter:** Soda lime glass OR tempered glass	**1 mark each**	**4**
	d) Ans.	**Explain the method by which waterproofing of existing old slab can be done.** i) Clean the slab ii) Expose cracks by tools and make them 'V' shaped. iii) Fill mix of cement mortar iv) Fill brick bats and sand over the slab v) Sprinkle cement slurry and paste of water proofing chemical or compound and cure it for 3 days.	**4**	**4**

		vi) Fix china chip tiles over the layer of cement mortar 1:3 vii) Cure it for 3 days and slab is water proof.		
4		**Attempt any THREE of the following:**		**12**
	a) **Ans.**	**Explain defects in timber with neat labeled sketches** **a) Knots**: These are the bases of branches which are broken off from the tree. This occurs because of improper cutting of tree. **b) Shakes:** These are cracks in the timber which appear due to excessive frost or twisting due to wind during growth of tree. **c) Wind cracks:** If wood is exposed to atmospheric agencies, its exterior surface shrinks which results in cracks **d) Twist and wrap:** Twist is when a timber is spirally distorted along its **length.** Warp is twisting out of shape. **e) Cup:** This is curvature formed along the transverse direction of timber **f) Bow:** This is bending along the longer side of timber.    **Twist** **Wrap**	**2 marks for any two types and 2 marks for sketch.**	**4**

		 Cupping		
4	b) Ans.	**Explain the field tests performed on bricks for its suitability.** **a) Shape and Size:** In this, a brick is closely inspected. It should be of standard size and shape and should be truly rectangular with sharp edges. **b) Soundness:** In this, when two bricks are struck with each other, clear ringing sound should be produced. **c) Hardness:** In this, when a scratch is made on brick surface with the help of finger nail, no impression should be made on the brick. **d) Colour:** The colour of the bricks should be reddish brown **e) Water absorption test:** After immersing the bricks in water for 16 hours, it should not absorb more than 20% water of its weight. **f) Dropping test:** In this test, when the burnt clay bricks are dropped flat on hard ground from a height of about 1m, it should not crush into pieces. This indicate good strength of brick.	**1 mark each (Any four)**	**4**
	c) Ans.	**State various thermal insulating materials. State any two properties of insulating material** **Thermal insulating materials:** 1) Asbestos 2) Aluminum Foil 3) Thermocol 4) Saw dust 5) Cork board slabs 6) Foam glass 7) Rock Wool 8) Glass Wool 9) Concrete Block 10) Flexible Blankets 11) Gypsum Boards **Properties:** a) It should be fire proof b) It should not absorb moisture c) It should be easy to handle d) It should be chemical proof. e) It should be bio resistant and dry f) Bulk density should be below 600kg/m^3	**½ mark each (any four)** **1 mark each (any two)**	**4**

		g) Pores: Most of the common insulating materials are porous in structure. The entrapped air or any other gas within the pores decreases the thermal conductivity of the material. h) Presence of Moisture: with the increase in moisture content, the coefficient of thermal conductivity rises greatly		
4	**d) Ans.**	**State important properties and uses of geopolymer cement** **Properties:** a) It gain ultimate strength within 24 hours and cures more rapidly than OPC. b) It has an ability to form strong chemical bond with all types of reagents and water. c)It is manufacture from industrial waste like fly ash d)It is environmental friendly green product e) It has fire and heat resistance f) It is highly resistant to acids, toxic wastes and salt waters. g) There is no CO2 emission. **Uses:** a) It is being developed and used as an alternative to OPC b) It can be used with any type of rock based aggregates, since it forms a strong bond c) Used in Construction of structure in sea water d) Partial replacement with OPC (80-90%), reduces CO_2 emission e) Since it is highly resistant to acids and chemicals, it is used in construction chemical industry and laboratory f) It is more effective in the construction of transportation infrastructure g) It protects aquifers and surface bodies of fresh water via the elimination of fly-ash disposal sites. h) Various applications in building industry	**1 mark (Any two)** **1 mark (Any two)**	**4**
	e) Ans.	**State the properties and uses of distemper** **Properties:** a) Less durable than paint b) Easy to apply c) Poor workability d) Available in variety of shades e) Costly f) Gives smooth and pleasing surface g) **Uses:** a) They are applied on internal surfaces on plastered cement concrete of buildings b) To paint the buildings from outside in areas of low rainfall	**1mark each (Any two)** **2**	**4**

5		**Attempt any THREE of the following:**		**12**
5	**a)** **Ans.**	**Define asphalt and state any three properties of asphalt.** **Definition:** It is a form of bitumen which is sticky, black and viscous liquid or semisolid in nature. Aggregates + bitumen = asphalt. **OR** It is an artificial mixture of bitumen and inert matter like alumina, lime, silica etc... **Properties:** 1. It is black or brownish in colour 2. It is elastic 3. Good insulator of heat and electricity 4. It is waterproof. 5. It has adhesive property 6. It softens as it is heated. 7. It hardens as it is cooled. 8. It is tough and durable material 9. It is soluble in C2S, Benzene, Naptha	**1** **1 mark each (Any three)**	**4**
	b) **Ans.**	**Describe the selection criteria for selecting stone for face work of building** 1. **Appearance**: Stone to be used for construction should be decent in appearance and have uniform colour 2. **Durability:** A Good building stone should be durable i.e. it should resist atmospheric action and should be long lasting 3. **Crushing strength:** For a good stone, the crushing strength should be more than 100 N/mm^2 4. **Facility of dressing:** Stones should be such that they can be dressed easily and economically. 5. **Specific gravity:** For a good building stone, the specific gravity should be more than 2.7 6. **Water absorption:** The percentage of water absorption of water by weight after 24 hours should not exceed 60% 7. **Resistance to fire:** Minerals in stones should be such that it should not catch fire easily. 8. **Seasoning:** Stones should be well seasoned before use.	**1 mark each (Any 4)**	**4**
	c) **Ans.**	**State the uses (two each) of the following construction materials:** **i) Soda lime glass** **ii) Ferrous metal** **i) Soda lime glass:** a) Used in window and plate glass b) Glass blocks c) Bottles d) Inexpensive table wares e) Fluorescent and incandescent light bulbs **ii) Ferrous metal:** a) CI (Cast Iron) is used in making rainwater and sanitary pipes b) Wrought iron is used in making nails, wires, chains	**1 mark each (Any two)** **1 mark each (Any two)**	**4**

		c) Square bars are used in making grills d) Rolled steel sections are used in making beams, columns and trusses. e) Corrugated sheets are used for roofing known as GI sheets f) Carbon steel is used for making tools g) Weld meshes are used for partition and fencing		
	d) **Ans.**	**State the two uses of the following construction materials:** **i) Hollow blocks** **ii) Pavement blocks** **i) Hollow Blocks:** a) Used for external load bearing walls, b) Panel walls, c) Columns, d) Retaining Walls e) Compound Walls, f) Used for sound insulation g) It Keeps the house cool in summer and warm in winter h) Load bearing and framed structure. **ii) Pavement blocks:** a) Used in parking areas b) Footpath, parks c) On roads to give pleasant look d) Petrol pumps e) gardens f) Airports g) Kids play area h) Jogging tracks	**1 mark each (Any two)** **1 mark each (Any two)**	**4**
5	**e)**	**State any two properties and any two uses of fly ash** **Properties:** a) It contains SiO_2, Al_2O_3, Fe_2O_3, CaO and some toxic elements b) Flyash together with bottom ash is a non-hazardous material c) These particles are spherical in shape d) It is a heterogeneous material **Uses:** a) Used in brick production b) Used for concrete production as a substitute for Portland cement and sand c) It is used as a building material d) Used in road construction e) Used in production of hollow concrete blocks f) Flyash light aggregates g) Used in agriculture h) Used for embankments i) Used for filling cracks j) Used for waste stabilization k) Used for land reclamation l) Used in cement production	**1 mark each (Any two)** **1 mark each (Any two)**	**4**

		m) Production of roller compacted concrete n) Used in geopolymers		
6		**Attempt any THREE of the following:**		**12**
	a) **Ans.**	**State four types of special mortars and give one use of each** **a) Fire resistant mortars: Uses:** a) Used with fire bricks for lining furnaces b) Used at fire places, ovens etc. **b) Injection mortar: Uses:** a) For protecting the reinforcement from corrosion b) Used for protection of steel c) Grouting work **c) Hydraulic insulating mortar:** **Uses:** Used for plastering various vessels for liquid products b) For walls of basements **d) Acoustic mortars:** **Uses:** Used for making sound proofing plaster. Used for heat proof constructions. **e) X ray shielding mortar:** **Uses:** Used for plastering of walls and ceiling of X ray room in hospitals and clinics **f) Light weight mortar:** Used in sound proof and heat proof constructions. **(Note: Marks should be given for any ONE use of any four types of mortar to be written)**	**1 mark each (Any four)**	**4**
	b) **Ans.**	**Enlist constituents of Plaster of Paris and state the two uses of Plaster of Paris** The constituents of POP are It consists of calcium sulphate. It is chemically $CaSO_4 . \frac{1}{2} H_2O$. It is obtained by calcining gypsum at 120 deg. C. by removing ¾ of water of crystallization. $$CaSO_4 \cdot 2H_2O + \text{heat} \rightarrow CaSO_4 \cdot ½H2O + 1½H_2O \uparrow$$ (steam) **Uses:** a) Used for making interiors for beautification, formation of columns b) Manufacturing of black board chalk c) Making casts of statues d) For surgical equipment and toys e) In dentistry it is used for dentures, metal filling f) Used by orthopedic surgeon for setting bones g) Used for wall plasters, wall boards, structural tiles.	**2** **2 (Any two)**	**4**
	c) **Ans.**	**Explain about geo synthetics materials. Mention application of it** Geosynthetics are man-made materials used to improve soil condition. Geo means earth or soil and synthetics means man made. Geo grids, geo textiles, geomembranes, geo cells are some of the Geosynthetics.	**2**	

6		They are made from petrochemical based polymers (plastics) that are biologically inert and do not decompose from bacterial or fungal action. **Applications:** a) It is used to improve soil properties b) It is used for drainage c) Also used for soil stabilization d) Used for erosion control e) Used for road construction f) Used to improve level grade soil situations like roads, valleys, laneways. g) To improve slope grade situations such as banks, hill sides. h) Reinforced soil- soil walls, bridge abutments, culverts, bridges, soil arches	**2** **(Any two)**	**4**
6	**d)** **Ans**	**Explain about Agro waste material. State its importance in construction.** Waste materials produced from agricultural byproducts such as coconut shells, sugarcane bagasse, straw, rice husk, coconut fibers, coconut and areca nut tree trunks, coconut leaves etc. are known as Agro waste materials which can be used as a construction material due to its various properties. **Importance:** a) Agro waste materials are used as a replacement of traditional building materials like bricks, cement, concrete etc. b) These materials are sustainable and eco friendly c) These are cost effective d) It is used as an alternative to aggregates for concrete and board production e) It is used as an insulation material for homes f) Manufacture of bricks g) Used as a renewable energy source h) Mixed with mortars and used in making of concrete pavers, roof tiles etc… i) Used in manufacture of floor tiles, brushes, mattresses j) Mixed with cement mortar which increases the impact strength	**2** **2** **(Any two)**	**4**

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