

BALASORE SCHOOL OF ENGINEERING

SUB - ADVANCE CONSTRUCTION TECH. & EQUIPMENTS

SEM : 6TH

BRANCH : CIVIL

SUB : CODE – CET 605 (TH-05)

Er D.Barik

Ch-1

1. What do you mean by fibres ? (2016-1(a)),2019-1(e)

Ans :Fiber is the indigestible part of plant bods that pushes through our digestive system, absorbing water along the way & easing bowel movements.

2. What do you mean by PVC&RPVC ? (2016 2 (a),2019-6(b)iii,3(c)

Ans :PVC are formed from hydrochloric acid, lime stone& natural gas or coal. Rigid ploy vinyl chloride is stronger & more rigid material than polyethyleneowing to the presence of CH₃ group attached to the linear molecular chains.

3. Write short notes on (2016 2(C),2019-3(c)ii,6(b)i,7(a)

- i. Cladding ii) Micro silica
- ii. Artificial sand iv) Acoustics material

Ans : (i) Cladding : Cladding is the application of one material over another to provide skin or layer intended to control the infiltration of weather elements or for aesthetic purposes.

iii. Microsilica :Silicafumeis also known as Micro silica it is an amorphouspolymorph of silica dioxide, silica. It is an ultrafine power collected as a byproduct of the silicon & ferrosilicon alloy production.

iv. Artificial Sand :The artificial sand produced by proper machines can be a better substitute to river sand. The sand should be sharp, clean & course. The grains should be of durable materials.

v. Acoustics Material:An acoustic material is a material designed to control direct & manipulate sound waves as these might occur is gases liquids & solids.

5 Marks

1.What are the different properties and uses of artificial timber? 2019 2(a)

Color: The lighter the color is, the weaker is the timber. There is a variation of color from one tree to the other. If you observe carefully, freshly cut walnut, teak, and deodar have dark brown, golden yellow and whitish color shades respectively.

Appearance: Good timber is known by its characteristic aroma.

Hardness: Check the hardness of timber for resistance and other attributes.

Specific Gravity: Usually, the specific gravity (the ratio of its density to that of the other) of timber varies from 0.3 to 0.9. The specific gravity depends heavily on the pores present. As the pores decrease, it may increase to more than 1.5.

Moisture Content: Timber is naturally hygroscopic. The more the water content, the more it is susceptible to fungal attacks.

Grain: Grain arrangement in timber can be of various types like straight, coarse or interl

Uses:

1. Timber has a wide variety of uses in construction & as an industrial raw material.
2. Timber is used for heavy duty construction work such a railway sleeper or the construction of piers .

2. Describe briefly how plastics are used in construction of structure. 2019 2(g)

1. Dimensional Stability

Thermo-plastic types of plastics can be easily reshaped and reused. But in the case of thermo-setting type plastics, it is not possible to reshape or remold the material.

2. Ductility of Plastics

Ductile nature of plastic is very low. When tensile stress are acting on plastic member they may fail without any prior indication.

3. Electric Insulation

Plastics are good electric insulators. So they are used as linings for electric cables and for electronics tools.

4. Fire Resistance

The resistance to temperature or fire for varieties of plastics considerably varies depending upon the structure. Plastics made of cellulose acetate are burnt slowly.

5. Fixing

Fixing of plastic materials is so easy. We can bolt, drill or glued to fix plastic material position.

Ch-2

(2Marks)

1 Define fabrication (2016 4(a))

Ans :Fabrication is the manufacturing process which an item is made from raw or semifinished materials instead of being assembled from ready made components.

Ch-2 (5 Marks)

1. Classify fabrication & describe . (2016 4(b))

Ans. :Fabrication classified as following types .

- a. Cutting (ii) folding (iii) Machining (iv) Punching (v) Shearing (vi) Stamping (vii) Welding
- i. Cutting : There are many ways to cut now a days. The old standby is the saw.
- i. Folding : Some parts need to be bent. The most common method is a press brake. It has a set of dies that pinches the metal perform in very specific cases due to the movement of the part.
- ii. Machining: This is the process of removing metal forms a piece of material. It might be done on a lathe. Where the material rotates against a cutting tools.
- iii. Punching : It is the act of a punch& die forming a scissor effect on a piece of metal to make a long on a piece of metal.
- iv. Stamping : Stamping is very similar to punching except the material is not cut.
- v. Welding : Welding is the act of joining twopieces of metal together. A variety of types of welding exist for use in different application.

CH-2 (7 Marks)

1. Write the advantage & Disadvantages of fabricated .2019 2(c)

Ans : Advantage :

- i. Moving partial assembles from a factory often costs less than moving preproduction resource to each site.
- ii. Deploying resources on site can add costs, prefabricating assemble can save costs by reducing in site work.
- iii. Factory tools :-Jigs, cranes, conveyors etc can make production faster & more precise.

Disadvantages :-

- i. Transportation costs may be higher for voluminous prefabricated section than for their constituents materials which can often be packed more densely.
- ii. Large fabricated section may require heavy duty cranes & precision measurements & handling to place in position.

Chapter-3

1. What do you mean by shear wall 2016[6(a)]

Ans:-A shear wall that is primarily designed to resist lateral forces in its own place.

2. What do you mean by earthquake [2015.3.(a)],2019 -1(f)

Ans:- Earthquake is a sudden violent shaking of the ground, typically causing great destruction, as a result of movement within the earth's crust.

3.What do you mean by building configuration? (2019-1-i)

Ans:- Building having simple regular geometry & uniformly distributed mass & stiffness in plan as well as in elevation suffer much less damage is known as building configuration.

4. What is lateral load resisting system ? (2015 4 (a))

Ans:- Lateral loads resisting system is the architectural planning of a building . The load must be closed loops, so that it is able to transfer all the forces acting either vertically or horizontally to the ground.

5 Marks

1. What are the additional strengthening measure in masonry building ? 2016 3(b), , 2015 3 (C) (2019-5(c))

Ans :The earthquake force shall be calculated for the full dead load plus the percentage of imposed load.

- The proportions of imposed load indicated above for calculating the lateral design forces for earthquakes are applicable to average conditions.
- Lateral design force for earthquakes shall not be calculated on contribution of impact effects from imposed loads.
- When the lateral load resisting elements are oriented along orthogonal horizontal direction the structure shall be designed for the effects due to full design earthquake load in the horizontal direction at time.
- When the lateral load resisting elements are not oriented along the orthogonal horizontal directions, the structure shall be designed for the effects due to full design earthquake load in one horizontal direction plus 30 percent of the design earthquake load in the other direction.
- When effects due to vertical earthquake loads are to be considered the design vertical force shall be calculated.
- Other loads apart from those given above shall be considered as appropriate.

2. Enumerate safety considerations during additional construction and alteration of existing buildings. 2015 -3(b)

Ans : If sufficient precautions w.r.t safety of work aren't taken, there are chances of serious accidents involving heavy loss of men and materials. Some of the safety rules to be observed during the erection process of structures are as follows.

- All guys and anchorages should be closely viewed regularly so as to ascertain their bearing capacity of load.
- Suitable packing pieces must be provided at the required points so as to avoid the slipping of load.
- The chains should not be dropped from a height, but should be lowered gradually.
- The equipment and devices employed in the erection procedure should never be overloaded. The legs of brother chains should not be opened out to such an angle so as to endanger the stability of the work.

- The levels of panel points on the falsework should be maintained as per the desired camber for truss to avoid strain or distortion during assembly. The lifting devices and mechanisms should be

3. State different plan configuration problems : 2019-2(f)

Ans. To perform well in an earthquake a building should possess four main attributes, namely simple and regular configuration and adequate lateral strength, stiffness and ductility.

- * A building shall be considered as irregular for the purposes of this standard if at least one of the conditions given is applicable.
- * Plan configuration of a structure and its lateral force resisting system contain re-entrant corners, where both projections of the structure beyond the re-entrant corner are greater than 15 percent of its plan dimension in the given direction.
- * Discontinuities in a lateral force resistance path, such as out-of-plane offsets of vertical elements.
- * A in plane offset of the lateral force resisting elements greater than the length of those elements.

4. Describe briefly the structural irregularities 2016 6(b), 2019-3(b)

Ans : The structural Irregularities in Building :-

The configuration of load resisting system of building is an important test in seismoresistant construction. IS 1893 (Part-1):2002 has recommended building configuration system for better performance of buildings during earthquakes. An important feature in building configuration is its regularity and symmetry in horizontal and vertical plane. Seismic behaviour of irregular shaped plans as shown in figure below differs from regular shapes because the first can be subjected to their asymmetry and it can present local deformation due to presence of re-entrant corners or excessive openings. Both effects give origin to undesired stress concentrations in some resisting members of the building. On the contrary, the ideal rectangular or square plan, structurally symmetric with enough in-plane stiffness in its diaphragm presents an ideal behaviour because it has the same displacement at every point in the slab. Thus, building shaped like box such as rectangular both in plan & elevation, is inherently stronger than one that is L-shaped or U-shaped that is a building with wings.

(i) Vertical Irregularities:

- Vertical discontinuities in load path.
- Irregularities in strength and stiffness.
- Mass Irregularity.
- Vertical geometric Irregularity.
- Proximity of adjacent buildings.

(ii) Horizontal Irregularities

Torsional Irregularities

Re-entrant corners.

Non Parallel system

Diaphragm discontinuity

5. What are the vertical irregularities in structure building ? 2015 7(b)

Vertical Irregularities: Vertical discontinuities in load path - One of the major causes to structural damage in structures during strong earthquake is the discontinuities or irregularities in the load path or load transfer. It is desirable that the structure should contain a continuous load path for transfer of the seismic forces, that develops due to acceleration of individual elements, to the ground. Failure to provide adequate strength and toughness of individual elements in the system or failure to tie individual elements together can result in distress or complete collapse of the system. Therefore, all structural and non-structural elements must be adequately tied to the structural system to act as a unit. The load path must be complete and sufficiently strong. The sequence of general load path is as follows

- Earthquake forces, which originate in all elements of the building are delivered through structural connections to horizontal diaphragms.
- The diaphragms distribute those forces to vertical resisting components such as columns, shear walls, frames and other vertical elements in the structural system which ultimately these forces into foundation.

7 Marks

1. Describe different building characteristics from seismic performance point of view. 2019-5

Ans : Following are the different building characteristics from seismic performance point of view.

- * The seismic weight of the whole building is the sum of the seismic weights of all the floors.
- * Any weight supported in between storeys shall be distributed to the floors above and below in inverse proportion to its distance from the floors.
- * For calculating the design seismic forces of the structure the imposed load on roof need not be considered.

The seismic weight of each floor is its full dead load plus appropriate amount of imposed load.

- * While computing the seismic weight of each floor the weight of volumes and walls in any storey shall be equally distributed to the floors above and below the storey'. the total design seismic base shear along any principal direction shall be determined by the following expression.

$$V_B = Ah^w$$

where Ah = Design horizontal acceleration spectrum value.

W= Seismic weight of the building.

2. Described the assumption made in the earthquake resistant design of structures (2016 6 (c))

Ans- The following assumptions shall be made the earthquake resistant design of structure.

(I) Earthquake causes impulsive ground motions which are complex and irregular in character, changing in period and amplitude each lasting for a small duration. Therefore, resonance of the type as visualized under steady state sinusoidal excitations, will not occur as it would need time to buildup such amplitudes.

(ii) Earthquake is not likely to occur simultaneously with wind or maximum flood or maximum sea waves.

(iii) The value of elastic modulus of materials, wherever required, may be taken as for static analysis unless a more definite value is available for use in such condition.

Ch-4 (2 marks)

1. Define seismic retrofitting (2016 -3 (a))

Ans:- Seismic retrofitting is the modification of existing structures to make them more resistant to seismic activity, ground motion or soil failure due to earthquake.

2. What do you mean by retrofitting ? (2016 5 (1)),2019-6(a)

Ans :- Retrofitting refers to the additional of new technology or features to older system power plant efficiency, increasing output reducing emissions, home energy retrofit.

3. What do you mean by retrofitting of building ?2017 -1(c)

Ans :Retrofitting of buildings is generally more economical as compared to demolition and reconstruction even in the case of severe structural damage.

CHAPTER-4 (5 MARKS)

1. Described briefly about the source of weakness in RC frame building (2015 4(b) 2016 1(b), 2019-2(e))

Ans : Source of Weakness in RCC Frame building: Earthquake engineering is not a pure science rather it has been developed through the observation of failure of structure during earthquake. Damage survey reports of past earthquakes reveal the following main sources of weakness in reinforced concrete moment resisting frame buildings.

(i) discontinuous load path.

(ii) lack of deformation compatibility of structural members.

(iii) quality of workmanship and poor quality of materials.

(1) Structural Damage due to Discontinuous Load Path:

Every structure must have two load resisting systems:

(a) Vertical load resisting system for transferring the vertical load to the ground and

(b) Horizontal load resisting system for transferring the horizontal load of the vertical load system. Its imperative that the seismic forces should be properly collected by the horizontal framing system and properly transferred into vertical lateral resisting system. Any discontinuity in this load path or load transfer may cause one of the major contributions to structural damage during strong earthquakes.

(ii) Structural Damage due to lack of Deformation:

The main problems in the structural members of moment resisting frame building are the limited amount of ductility and the inability to redistribute load in order to safely with stand the deformations imposed upon in response to seismic loads.

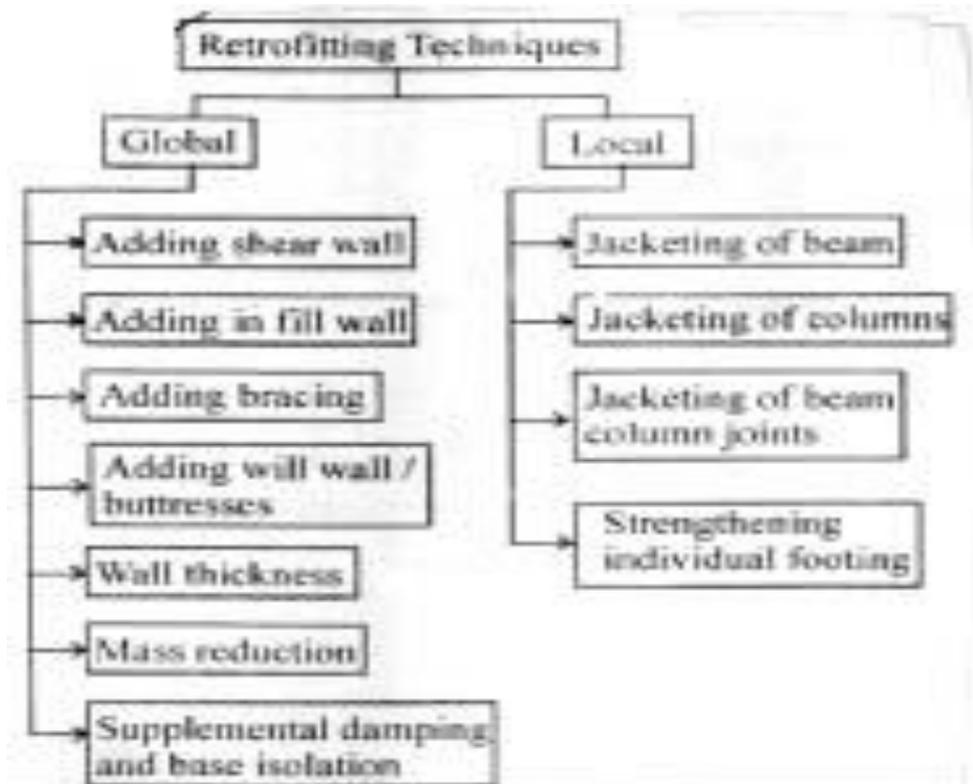
(iii) Quality of Workability and Materials:

There are numerous instances where faulty construction practices and lack of quality control have contributed to the damage.

Ch-4 7 Marks

1. Classify retrofitting techniques and describe their uses. 2019-3

Ans :



Structural Level Global Retrofitting :

Adding New Shear Walls One of the most common methods to increase the lateral strength of the

R.C. buildings. It is the last simple method.

Limitation Increase in lateral resistance but is concentrated at a few places.

—, Increase dead load of the structure.

Adding Steel Bracing Higher strengths stiffness can be proved. Opening for natural light can be made easily It have much less out.

Limitation A moderate to high level of skilled labour is necessary.

—> Lack of information about the seismic behaviour of the added bracing.

—Undesirable changes takes place. Adding mull Wall: It is an effective economical method for improving strengths reducing drift of existing frames.

Limitation

Some columns in the frame are subjected to large axial tensile forces, which may exceed the capacity.

A strong masonry in fill may result in a failure of the columns of existing frame. Local or Member Retrofitting

Local retrofitting are typically used either when the retrofit objectives are limited or direct treatment of the vulnerable components is needed.

Jacketing

Jacketing is the most popularly used materials for strengthening of building columns.

The most common types are steel jacket R.C. jacket fibre reinforced polymer composite jacket jacket with high tension materials like carbon fibre glass fibre etc.

Purpose

To increase concrete confinement by transverse fibre/reinforcement, especially for circular cross-sectional columns.

To increase shear strength by transverse reinforcement.

To increase flexural strength by longitudinal fibre.

ER.P. Jacketing

Carbon fibre is flexible and can be made to contact the surface tightly for a high degree of confinement.

Confinement is of high degree coz carbon fibre is of high strength and high modulus of elasticity.

It has light wt 8 rusting does not occur.

Ch-5 (2marks)

1. Define light intensity (2016 (6 (a)),&How is the intensity of light measured ? 2019-2(a),1(h)

Ans:- Intensity is like brightness & is measured as the rate at which light energy is delivered to a unit of surface or energy per unit time per unit area.

And

Light intensity is measured by candela.

2. Distinguish between escalator & elevator ? (2015-6 (b))

Ans:- Escalator is a power driven, inclined, continuous stairway used for raising and lowering passengers. Elevators are defined as moving steps running between two floors.

3. What do you mean by earthing in electrical (2016- 7(a))

Ans:- A wire coming from the ground 2.5 to 3 metres deep from an electrode is called earthing.

4. List out the type of wiring 2016 7(a),2019-2(b)

Ans:- wiring are 3 types (i) C.T.S. wiring (ii) conduit wiring (iii) concealed conduit wiring.

5. What is ventilation ? (2015 6 (a)),2019-5(a)

Ans :- Ventilation is the provision of fresh air to a room, building etc.

6. What is earthing & fuse ? (2015 5 (a))

Ans:- Fuse :- It is an electric circuit used as a safety device.

Earthing :- It is also used for safety. It prevents to minimize the risk of shock.

Ch-5 Marks

Ans. There are three types of wiring,2019-2(b)

(a) C.T.S. (Cotton/P.V.C Toughened I Sheathed) Wiring : The conductor is provided with insulation which is not water or heat proof. Over the insulation of the conductor and tough rubber sheath is provided for additional insulation and protection against wear, tear and moisture.

This type of wiring is suitable for damp circuits, but can not sustain much heat and is not suitable for places in very hot weather. There is also the danger of mechanical damage. It is also not suitable for outdoor wiring. It should not be exposed to direct sunlight or areas where there are corrosive acids or alkali fumes.

(b) Conduit wiring: In this system wires with single insulation are used. The wires are run in steel p.v.c conduits giving good protection from mechanical injury or fire risks. This types of wiring is used for industries.

(c) Concealed conduit wiring : This system is same as conduit wiring except that the conduits are buried in the chase made on the walls. This system is wed where aesthetics is the main consideration and not the additional cost of conduit.

2. Write a shortnotes on

(i) Escalator (ii) Elevator (iii) Lifts (2015 6 (b))

Ans : Escalators

- It is a power driven, inclined continuous stairway used for raising and lowering passengers.
- It consists of (i) escalator (ii) the track (iii) the handrail (iv) balustrading (v) steps (vi) combplates and (vii) landing.
- It being a continuous one waiting as is required in case of lift is eliminated hence it is commercially

Elevator :-

- Elevators are defined as moving steps running between two floors.
- Elevators move between the different floors in such a way that the traffic remains stationary on a particular step while the steps move this arrangement helps in moving large number of people at a time without congestion.

Ans. Lifts

Lifts are known as vertical transportation system.

A lift is defined as an appliance designed to transport persons or materials between two or more levels in a vertical direction by means of a guided car or a platform.

The first safety lift was designed by Otis in 1853.

The development of lifts was felt necessary to encourage the construction of tall buildings.

2. State General Principles for central plants layout for hot water supply. 2019-5(b)

Ans. Layout of Hot Water Supply The sequence of units to be installed in the layout of any water supply project starting from the source of water to the distribution is as follows:

Location of intakes including pump and plant.

Plain sedimentation tanks.

Coagulation sedimentation tanks.

Filter units.

Water softening and other miscellaneous treatment plants.

Disinfection plant.

Storage of clear water in underground and overhead reservoir tanks and

Distribution of water.

4. What are the points to be considered for selection of wiring ? 2016 7(b)

Ans:- The points to be considered for selection of wiring are follows:—

- (i) Cost of wiring:- The initial cast of the wiring system to be chosen or selected as one of the paramount factors to be considered. It should be economical & safe.
- (ii) Durability :- when making choices for wiring system, the wiring type should be durable & should also be of proper specification.
- (iii) Maintenance cost:- wiring system employed should have low maintained cost.
- (iv) Mechanical protection:- The wiring should be protected from mechanical damage during its use.
- (v) Appearance:- The wiring should provide a good look after its installation.

Describe different methods and systems of ventilation (2015 6 (C),2019-2(b)

Ans : Methods of ventilation : The method of ventilation may broadly be divided into the following two categories :-

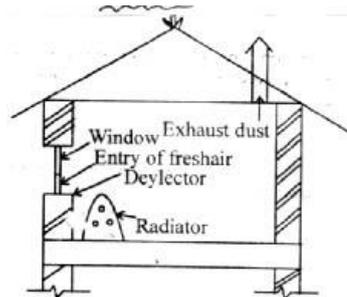
- i. Natural ventilation.
- ii. Artificial or mechanical ventilation.

1. Natural Ventilation :

In this system of ventilation the use is made of doors windows, ventilators and skylights to make the room properly ventilated. This system is useful for small buildings and it can not be adopted for big offices, theatres auditoriums etc. The only advantages of this system is useful for small buildings and it can not be adopted for big offices, theatres auditoriums etc. The only advantages of this system are that it is economical in the sense that no special equipment is necessary for making the room adequately ventilated and that it affords living under natural conditions.

The important points to be remembered in connection with natural ventilating systems are :-

- i. The location size and type of windows play a great role in imparting natural ventilation to the room. The windows also supply light and affords protection against weather. All these functional requirements should be properly correlated while deciding the location of windows in a room.
- ii. The efficiency of roof ventilators depends on their location wind direction and height of building.
- iii. It is found that the window ventilation with a combination of radiator deflector and exhaust as show in figure below. Can give better results. The radiators are situated below the sill level of the windows and they extend for the full length of the window.



The windows, deflector and radiators should be properly manipulated for achieving the desired effects. The exhaust duct is provided near the ceiling of the opposite wall and it is taken out of the roof to act more or less like a chimney. The windows open from bottom and the deflectors may be of curved vanes.

2. Artificial Ventilation :

In the system of ventilation some mechanical arrangement is adopted to provide enough ventilation to the room. This system has become popular due to recent change in notion regarding ventilation. The system is costly but it results in considerable increase in the efficiency of the persons under the command of the system. This system is adopted for big offices, banks, industrial plants, theatres, auditoriums etc.

The five systems of the artificial ventilation :

- (i) Exhaust system
- (ii) Supply system
- (iii) Combination of exhaust and supply systems
- (iv) Plenum process
- (v) Air-conditioning

(i) Exhaust System :

i. Exhaust System :

In this system the partial vacuum is created inside the room by exhausting the vitiated inside air by fans/blowers.

ii. Supply system :-

This system is just the reverse of the above system and it consists in supplying fresh air to the room by installing input fans in outside walls.

iii. Combination of Exhaust and supply systems :-

This system is the combination of the above two systems. The exhaust fans and input fans are installed in suitable places in the outside walls so as to cause a current of fresh air from outside to inside of the room. The combination of both the systems gives better results.

iv. Plenum Process

This system is mostly used in cold countries and comprises a complete ventilation and heating unit. It includes:

- (i) A filter of air washer.

- (ii) A heater warmed by hot water, electricity steam or gas.
- (iii) A centrifugal fan for forcing the warm air.
- (iv) A system of distributing ducts connecting every room to the building.

v. Air Condition :-

This is the most effective system of artificial ventilation and as it involves many other aspects a separate discussion now follows : The term air conditioning is used to indicate the science of controlling or conditioning air with respect to humidity temperature movement of air, odour, bacteria content dust contact etc. So as to make the air to suit the physiological requirements of the human body or to the needs of Industrial process.

Give a brief account of soil and waste water installation in high rise buildings. Highlighting the salient features.

Ans. Materials used for Waste and Discharge

Material	Application	Joining
Cast iron	→ 50mm & above vent & discharge stages.	→ Lead, caulking with molten or fibrous lead, cold compound caulking.
Galvanized stees	→ Waste pipes	→ BSPT screw ad
Copper	→ Waste pipes and traps	→ Compression, capillary, silver solder, bronte weld or push, fitting seal.
Lead	→ Waste pipes and discharge stacks.	→ Soldered or lead welded.
ABS	→ Upto 50mm waste and vent pipes.	→ Solvent cement and push fit ring seal.
High density polythylene	→ Upto 50mm waste & ventilating pipes & traps	→ Push fit ring seal and compression fittings.
Polypropylane	→ Upto 50mm waste and ventilating pipes & traps.	→ Push – fit ring seal and compression coupling.
Plasticized PVC	→ Upte 50mm waste and vent pipes.	→ Solvent cement and push fit rng seals.
Unplasticized PVC	→ Over 50mm soil and vent stress and vent pipes under 50mm.	→ Solvent cement and push fitting seals.

Ch-5 (marks)

1. Describe about the electrical services for a high rise building including wiring, fuses fitting & earthing. 2015 5 (C),2019-2(d)

Ans.- The electrical services requirements in high rise buildings are:

Durability: The wiring to be selected must be able to withstand wear and tear due to the action of weather, baffles, dampness etc.

Safety: It is the most important pint to be considered. The system selected should be such that even with poor workmanship, no dangerous result may be produced.

Mechanical: The wiring must be protected from damage of a physical protection nature during its use in building.

Appearance: Appearance is an important consideration from the architectural point of view.

2. Earthling means connecting the neutral point of a supply system of the non current carrying metal plates used in electrical installation distribution system to the general mass of earth by conductor wire of negligible resistance.

Ch-6 (2- mark)

1. What are the function of dragline & bulldozer ? 2019-1(j)

Or

What is dragline ? 2015 7(a)

Ans.- Dragline is one type of excavator, which is used for digging at or below the operating level.

A bulldozer is a very useful equipment and can be used on the construction work for the following purposes:

To

To clear the site at work.

To make the land level.

2. Give two examples of compacting equipments . 2017 4 (a)

Ans.- Bulldozer, dragline, Roller.

3. What is planning of construction equipment ? 2016-6 (a)

Ans.- Planning of construction equipments can be used for a variety of construction operations without any difficulty & they are easily available in standard commercial sizes.

Ch-6 (8 Marks)

1. Distinguish between earth moving and compacting equipments. Enumerate them giving their specific use. 2019-4

Ans. Earth Moving Equipments The process of cutting or loosening and removing earth from its original position, transporting and dumping it as a fill or spoil bank is known as excavation.

- it may be required for soil, soft rock or even hard rock before preparing the subgrade.
- The excavation will also be required for the construction of side drains. The choice of suitable excavation equipment will primarily depend on the nature of soil to be excavated.
- These are intermittent types of equipments Tractors, Power shovels, draglines, bulldozers.
- Tractor is a self-propelled machine which is used mainly to exert a powerful attractive force for pulling other machines.
- The tractors are used for agricultural operations such as hoeing, tilling, harvesting etc.

Compacting Equipments :

- The compaction of soil in the field is to be achieved by like use of some equipment, the most common being road rollers.
- The rollers to produce vibrations from 1000 to 5000 per minute.

- For getting maximum effect, the actual number of vibrations should correspond to the natural resonant frequency of the soil.
- The principle on which a road roller is working is the application of pressure which is slowly increased and is then gradually.
- The rollers are suitable to compact a wide range of soils, preferably granular soils and pavement materials for the various layers.

3. Write shortnotes on 2019-7(b) (2016 7 (c))

- i) Soil reinforcing
- ii) Smooth wheel roller
- iii) Vibrating compactor
- iv) Bulldozer

Ans (i) Soil reinforcing :- Reinforcing of soil can generally be subdivided into 2 categories (i) Reinforced soil. (ii) in situ reinforcement .

- Soil reinforcing may be made with a number of materials (i) Wooden geotextiles (ii) steel strips (iii) welded wire mesh
- Reinforced soil structures fall broadly into 3 classes.
 - (i) Mechanically stabilized earth
 - (ii) Reinforced slopes
 - (iii) Reinforced foundation.

(ii) Smooth wheel roller:- It is a compacting type Engineer vehicle . It is two types.

- a) Static smooth wheeled roller
- b) Vibrating smooth wheeled rollers.

- The performance of smooth wheeled rollers depends on load per cm it transfers to the soil & diameter of the drum.

(iii) Vibrating compactor:- Vibrating creates impact forces & these forces result in greater compacting energy than an equivalent static load.

- The impact forces are higher than the static forces because the vibrating drum converts potential energy into K.E.
- (iv) Bulldozer:- Bulldozers are excellent machines for stripping, which is the removal of a thin layer of covering material.
- (v) Dozers are economical machines for moving material a maximum of 300ft in the case of large machines.
- (vi) The economical push distance decreases as dozer size decreases but economical push distance also depends on the material being handled.

3. Write a shortnotes on (2015 4 (c))

- (i) Pneumatic tyred roller
- (ii) vibrating compactor

(iii) power shovel

Ans:- Pneumatic tyred roller:- These are surface rollers that apply the principle of kneading action to affect compaction below the surface. They may be self to drive forward.

- Pneumatic are used on small to medium size soil compaction jobs, primary on bladed granular base material

(ii) vibrating compactor:-

Ans:- Vibrating compactors are used compaction of cohesion less soils. These compactors are used because the vibration creates impact forces which results greater compacting energy than equivalent static load and thus, can be able to free the inter-locked circular particles of cohesion less soils.

(iii) Power shovel :- It is used principally for excavation & removal of overburden in open cut mining operation.

Shovel are used for hard digging above track level & for loading haul units.

Ch-7 (5 Marks)

1. Write short notes on any two (2016 5(b),2019-7(d))

- Wire mesh
- Geosynthetics
- Slope Stabilization

Ans :Wire mesh : Wire mesh is an electric fusion welded prefabricated joined grid consisting of series of parallel longitudinal wires with accurate spacing welded to cross wires at the required spacing.

It is used to screen out inserts.

Wire mesh is also used for guarding for secure areas & as protection in the form of vandal screens.

- Geosynthetics : Geosynthetics are synthetic products used to stabilised terrain. They are generally polymeric products used to solve civil engineering problems . This includes eight main productcategories :-
 1. Geotextiles, geogrids, geonets, geomembrane, geosynthetic clay liners, geoforms & geocell&geocomposite.
- Slope Stabilization :It is the potential of soil covered slopes to withstand &under gomovement. Stability is determined by balance of shear stress &shear strength.
- Slope stabilization can be achieved through slope reinforcement by constructing structure elements through the failure plane.