**BASIC TECHNOLOGY JSS 2**

**THIRD TERM**

**SCHEME OF WORK**

**WEEK TOPICS**

1. Revision of Last Term’s work
2. Belt and Chain drives
3. Belt and Chain drives (Contd.)
4. Gears
5. Gears (Contd.)
6. Hydraulics and Pneumatic Machines
7. Building Construction I: Site Preparation
8. Building Construction II: Setting Out
9. Building Services: Taps and Water supply
10. Practical Projects

**REFERENCE MATERIALS**

* MELROSE, Basic Science and Technology Book 2
* NERDC, Basic Technology for JSS, Book 2

**WEEK ONE**

**TOPIC: Revision of Last Term’s Work**

1. A plane figure bounded by four equal sides is called \_\_\_ (a) square (b) rectangle

(c) trapezium(d) kite

1. Opposite sides of a parallelogram are \_\_\_ (a) diagonal (b) parallel (c) vertex (d) straight
2. \_\_\_ is a plane figure enclosed by three straight lines(a) Triangle (b) Quadrilateral

(c) Pentagon (d) Heptagon

1. An octagon is a polygon with \_\_\_ sides \_\_\_ (a) 5 (b) 6 (c) 7(d) 8
2. The sum of angles in a quadrilateral is \_\_\_(a) 90 (b) 180 (b) 270 (d) 360
3. What is the center rule formula used to construct a polygon? (a) 360 – N (b) 360 x N

(c)360/2(d) 360 + N

1. A regular polygon has \_\_\_ of its sides and angles equal (a) five (b) all (c) three (d) four
2. The opposite angles in a parallelogram are \_\_\_ (a) equal (b) unequal (c) positive

(d)negative

1. Plane figures are identified by the number of \_\_\_ enclosing them(a) points (b) sides

(c)values(d) circle

1. A line that joins two opposing corners of a quadrilateral is called \_\_\_(a) plane

(b)diagonal(c) angle (d) vertex

1. Each angle in a regular pentagon is \_\_\_ (a) 60 (b) 72 (c) 82 (d) 92
2. A machine that is used to resaw or prepare timber into suitable sizes for articles of joinery and furniture is known as (a) Circular sawing machine (b) Surface planing machine

(c) Milling machine (d) Thicknessing machine

1. A machine that is used exclusively for planing wood to a specific thickness after surface planing operation is called \_\_\_ (a) Circular sawing machine (b) Surface planing machine (c) Milling machine (d) Thicknessing
2. A wood working machine, which can also be used as machine tools, used for performing various operations such as boring, sanding and mortising is known as (a) Drill press

(b) Surface planing machine (c) Milling machine (d) Thicknessing

1. Which of the following is not a type of scale drawing? (a) Reduced (b) Enlarged

(c) Extended (d) Full

1. A quadrilateral with only two parallel sides is called \_\_\_ (a) square (b) rectangle

(c) trapezium (d)kite

1. Which of the following is used to rotates the work and transmits movement to saddle of a lathe? (a) the bed (b) the headstock (c) the saddle cross slide (d) main spindle
2. The following are work holding methods except (a) catch and carrier (b) face plate

(c) saddle (d) chuck

1. Which of the following provides a plane surface for mounting and moving accessories at a constant level on a lathe machine? (a) the bed (b) the headstock (c) the saddle cross slide (d) main spindle
2. Which of the following permits movement of tool at angle other than right angle? (e.g. for conical work) (a) the compound slide (b) the head stock (c) the slide cross slide (d) main spindle
3. The space occupied by a plane figure is called \_\_\_ (a) diagonal (b) area (c) volume

(d) theorem

1. The lubricant commonly used in transmission system is (a) diesel(b) gear oil (c) grease (d) hydraulic
2. Constant lubrication of a machine is to prevent (a) corrosion (b) exhaustion (c) high speed (d) sulphation
3. Which of the following will not reduce friction? (a) lubrication (b) use of rollers (c) use of pulleys (d) drying
4. Which of the following is not a practical application of friction? (a) belt drive (b) cable drive (c) chain drive (d) clutches
5. MRO stands for (a) Machine, relevance and operations (b) Maintenance, repair and operations (c) Maintenance, relevance and organization (d) Machine, repair and organization
6. Which of the following is not a part of lathe machine? (a) head stock (b) main spindle

(d) steadies (d) shaper

1. Which of the following triangles has none of its side equal A. Equilateral B. Scalene C. Isosceles D. Right-angled
2. The rougher the surfaces in contact, the …….. the frictional force (a) greater (b) lesser (b) partial (d) equal
3. Maintenance of metal work machines should include (a) periodic servicing (b) drying

(c) manufacturing (d) bending

**WEEK TWO**

**TOPIC: BELT AND CHAIN DRIVES**

**CONTENT**

* Definition
* Types
* Uses

**BELT DRIVES**

A belt is a looped strip of flexible material used to mechanically link two or more rotating shafts. A belt drive offers smooth transmission of power between shafts at a considerable distance. Belt drives are used as the source of motion to efficiently transmit power or to track relative movement. When the belt is used for speed reduction, the smaller sheave is mounted on the highspeed shaft, like the shaft of an electric motor. The larger sheave is then put on the driven machine.



**TYPES OF BELT DRIVES**

The types of belt drives are diverse. The list of its kinds include the flat belts, synchronous timing belts, cog belts, vee-belts, round belts, multi-groove belts, ribbed belts, film belts, metal belts, endless round belts and speciality belts. Some of them are explained below:

1. **The Flat belt:** The simplest type is often made from leather or rubber-coated fabric. The sheave surface is also flat and smooth, limiting the driving force by the pure fiction between the belt and the sheave.

2. **Synchronous Belts, or Timing belts:** These ride onsprockets that have mating grooves that the teeth on the belt seat. It is a positive drive, limited only by the tensile strength of the belt and the shear strength of the teeth.

3. **Cog Belts:** These are applied to standard V-grooved sheaves. The cogs give the belt greater flexibility and higher efficiency compared with standard belts.

4. **Vee-Belts:** The V-shape causes the belt to wedge tightly into the groove, increasing friction and allowing high torques to be transmitted before slipping occurs.

**BELT AND PULLEY ARRANGEMENT**

There are various types of belt and pulley arrangement. These include:

1. Open belt: An open belt connecting two pulleys makes them run in the same direction

2. Crossed belt; this changes the direction of pulleys.

3. V-belt: V-belts run on V-pulleys. A common use of the V-belt and V-pulley is the fan belt of an automobile.



**EVALUATION**

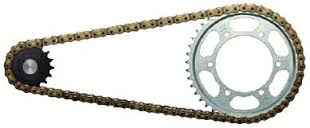
1. What is a belt drive?

2. State the types of belt drive

3. Explain each type of belt drive

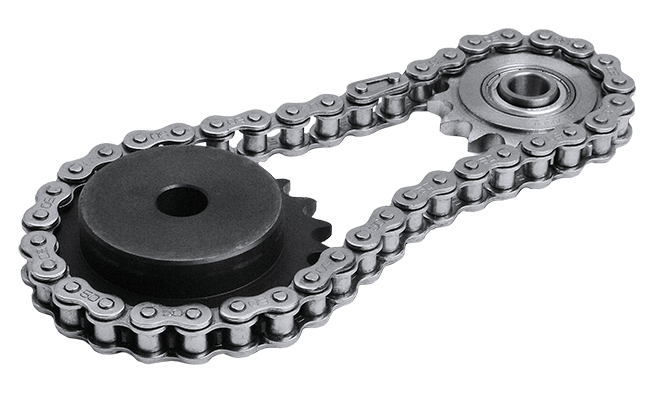
**CHAIN DRIVES**

A chain is a power transmission element made as a series of pin-connected links. The design provides for flexibility while enabling the chain to transmit large tensile forces. Chain drive is a way of transmitting mechanical power from one place to another. When transmitting power between rotating shafts, the chain engages mating toothed wheels, called sprockets.



**TYPES OF CHAIN DRIVES**

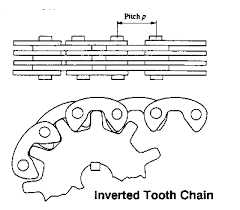
1. **Roller Chain Drives:** The most common type of chain is the roller chain, in which the roller on each pin provides exceptionally low friction between the chain and the sprockets. Roller chain is classified by its pitch, the distance between corresponding parts of adjacent links. The pitch is usually illustrated as the distance between the centers of adjacent pins. Standard roller chain carries a size designation from 40 to 240.



2. **Conveyor Chain :** Rollers sit proud of links and can roll along supporting surface It can be used for transporting materials, as rollers can support weight. Can also be used just to support weight of chain if transmitting power over long distances



3. **Inverted Tooth (or silent) Chain:** Sprocket teeth mesh with shaped links instead of rollers on chain. Joints between links use rolling rather than sliding contact. Profiles of links are more like involute gear teeth. Overall effect is to reduce noise.



4. **Leaf (or lifting) Chain:** It is designed for lifting rather (than power transmission). Do not have to mesh with sprockets, hence no rollers. Therefore can narrower than roller chain with equivalent strength. Example: fork-lift truck.

**EVALUATION**

1. What is a chain drive?

2. State the types of chain drive

3. Explain each type of chain

**GENERAL EVALUATION**

* 1. Differentiate between a belt drive and a chain drive
  2. State four(4) types each of belt and chain drives

**WEEKEND ASSIGNMENT**

1. The most common type of chain is the ……… chain. (a) inverted tooth (b) roller

(c) leaf (d) conveyor

2. Which of these types of chains can be used for transporting materials?(a) roller chain (b) conveyor chain (c) inverted tooth chain (d) leaf chain

3. ……….. is a power transmission element made as a series of pin-connected links.

(a) Iron (b) Belt (c) Chain (d) magnet

4. Which of the following offers smooth transmission of power between shafts at a considerable distance(a) Belt drives (b) Chain drives (c) Magnetic drives

(d) Electrical drives

5. Which of the following types of chain is used for lifting rather (than power transmission) (a) roller chain (b) conveyor chain (c) inverted tooth chain (d) leaf chain

**THEORY**

1. (a) What is a belt? (b) State the types of belt we have?

2. (a) State four (4) types of Chain drives (b) Explain any two

# WEEK THREE

**TOPIC: BELT AND CHAIN DRIVES II**

**CONTENT**

* Advantages and Disadvantages of Belt and Chain drives
* Uses of Belt and Chain Drives

**Advantages and Disadvantages of Belt Drives and Chain Drives**

**Advantages of Belt Drives:**

1. Simplicity and Cost-Efficiency: Belt drives offer a straightforward and economical solution for power transmission.

2. Non-Requirement of Parallel Shafts: Unlike some other drive systems, belt drives do not necessitate perfectly parallel shafts for effective operation.

3. Noise and Vibration Damping: Belt drives excel at dampening noise and vibrations, contributing to a quieter and smoother operation.

4. Lubrication-Free: They do not require lubrication, reducing maintenance efforts and costs.

5. Overload and Jam Protection: Belt drives come equipped with overload and jam protection mechanisms, enhancing their reliability and safety.

6. High Efficiency: They demonstrate high efficiency, often reaching up to 98%, with a typical efficiency of around 95%.

**Disadvantages of Belt Drives:**

**1.** Potential for Slipping and Stretching: Belt drives can experience slipping and stretching, leading to variations in angular velocity.

2. Heat Buildup: They are prone to heat buildup during operation, which can affect their performance.

3. Temperature Restrictions: Operating temperatures are typically limited to a range of -35°C to 85°C.

4. Adjustment and Compensation: Periodic adjustments of center distance or the use of idler pulleys may be necessary to compensate for belt wearing and stretching.

**Advantages of Chain Drives:**

1. No Slipping or Creeping: Chain drives do not suffer from slipping or creeping, making them more efficient than belt drives.

2. Compact Design: They offer a compact design, saving space in various applications.

3. Ease of Installation: Chain drives are often easier to install compared to belt drives.

4. Durability: They do not deteriorate due to factors like oil, grease, sunlight, or age.

5. High-Temperature Operation: Chain drives can effectively operate at high temperatures.

6. Resistance to Abrasion: They can withstand abrasive conditions, ensuring longevity.

7. Suitable for Wet Conditions: Chain drives can operate in wet conditions without a significant impact on performance.

8. Reversing Drives: They are suitable for applications requiring reversing drives.

**Disadvantages of Chain Drives**

1. Higher Production Cost: Chains generally have higher production costs compared to belts.

2. Precise Alignment Needed: Chain drives require more precise alignment than belt drives for optimal functioning.

3. Frequent Lubrication: They typically need regular lubrication to maintain their efficiency and longevity.

4. Noise and Vibrations: Chain drives can be noisy and may cause vibrations, which can be undesirable in certain applications.

5. Limited Slippage: They cannot be used in applications where some degree of slippage is required.

6. Load Capacity and Service Life: Chain drives do not have the load capacity or service life of gear drives.

**Evaluation Questions:**

1. List five advantages and four disadvantages of Belt drives.

2. Mention five advantages and six disadvantages of Chain drives.

**USES OF BELT DRIVES**

1. Belt drives are used for smooth transmission of power between shafts at a considerable distance

2. They are used to track relative movement

3. The sewing machine makes efficient use of synchronous timing belts

4. Automobiles also make use of the timing belt/ cam belt system

5. The treadmill is also a great example of a belt driven mechanism

**USES OF CHAIN DRIVES**

1. Chain drives are used inrigging and moving heavy materials

2. They are used in hydraulic lift truck operation

3. They are used in increasing or decreasing a driver’s output speed by altering gear ratios between the driver and the sprocket being driven

4. They also used as overhead hoists

5. They are also used in operating conveyer belts

**Differences between Belt Drives and Chain Drives**

**Belt Drives Chain Drives**

1. Belt drives are made up of polymers Chain drives are made of alloys
2. They can operate under high speed Chain drives can operate under high load conditions
3. They do not need lubrication They need lubrication
4. They need dry condition to work properly They can work in high temperature and

moist condition

1. They make nonoise They make noise
2. They are powered by a belt They are powered by a chain loop

**Similarities**

Both belt drives and chain drives are methods to transfer power and objects within a machine

**EVALUATION QUESTION**

1 State five (5) uses of Belt drives

2. Mention five (5) uses of Chain drives

**GENERAL EVALUATION**

1. State five(5) advantages of belt drives and five(5) disadvantages of chain drives

1. Mention five (5) uses each of belt and chain drives

**WEEKEND ASSIGNMENT**

1. ………. can be used as overhead hoist (a) Belt drives (b) Chain drives (c) Magnetic drives (d) Electrical drives

2. The sewing machine makes efficient use of ……. (a) The flat belt (b) synchronous timing belts (c) cog belts (d) V-belt

3. …………. are used for smooth transmission of power between shafts at a considerable distance (a) Belt drives (b) Chain drives (c) Magnetic drives

(d) Electrical drives

4. Which of the following require frequent lubrication? (a) Series drives (b) Parallel drives (c) Belt drives (d) Chain drives

5. Automobiles also make use of the (a) timing belt/cam belt system (b) Series/parallel system (c) current/potential system (d) hydraulic/lift system

**THEORY**

1. State five (5) uses/applications of (a) Belt drives (b) Chain drives

2. (a) Mention two (2) differences between belt and chain drives (b) State two(2)

Similarities between belt and chain drives

**WEEK FOUR**

**TOPIC: GEARS**

**CONTENT**

* Definition
* Types
* Lubrication of gears
* Uses

**Gears: The Mechanics of Motion Transmission**

A gear is a wheel characterized by teeth around its rim. These teeth interlock with those of another wheel, facilitating the transmission of motion.

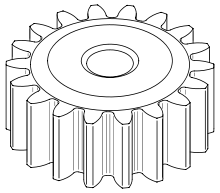
Operation:

When two gears engage, one assumes the role of the driver, propelling the system, while the other becomes the driven, solely responding to the driving force without generating power or energy. This fundamental concept is essential for understanding the mechanics of gear-based motion transmission.

**TYPES OF GEAR**

There are various types of gears, namely: Spur gear, Bevel gear, Rack and Pinion gear, Helical gear and Worm gears

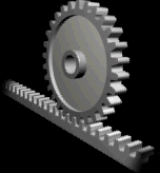
1. **Spur gears:** They are used for transmitting drive between parallel shafts.



2**. Bevel gears:** These are used for transmitting power/drive between shafts at angles.

[](https://en.wikipedia.org/wiki/File:Gear-kegelzahnrad.svg)

3. **Rack and pinion gears:** These gears are used for converting rotary motion of the pinion to linear motion of the rack.

[](https://en.wikipedia.org/wiki/File:Rack_and_pinion_animation.gif)

4. **Helical gears**: These gears can transmit motion and power between either parallel or right angle shafts.

5. **Worm gears**: These gears operate silently and smoothly. They can be used for reducing speed and increasing torque.

**Gear Lubrication**: Enhancing Efficiency Through Friction Reduction

Lubrication involves the application of oily or greasy substances to machine components, reducing friction and enhancing performance. The applied substance, whether oil or grease, is aptly named the lubricant.

**Purpose of Gear Lubrication:**

The lubrication of gears serves two primary purposes:

1. Reduction of Friction: It promotes smooth sliding between gear teeth, diminishing the coefficient of friction in the process.

2. Temperature Control: It helps limit temperature increases due to the rolling and sliding friction that occurs during gear operation.

**Methods of Lubrication:**

Three general methods are employed for gear lubrication:

1. Grease Lubrication: Ideal for low-speed applications.

2. Splash Lubrication (Oil Bath Method): Suitable for medium and high-speed scenarios.

3. Forced Oil Circulation Lubrication:Commonly used in high-speed situations, although exceptions exist.

The choice of lubrication method and lubricant depends on factors like tangential speed and rotating speed. While grease lubrication suffices for low-speed applications, medium and high speeds generally demand splash lubrication and forced oil circulation. However, exceptions may lead to the use of grease even at high speeds, particularly for maintenance purposes.

**Applications of Gears:**

Gears find diverse applications:

1. Power Transmission: They effectively transfer power from one shaft to another.

2. Speed Modification: Gears can alter the speed of shafts, either increasing or decreasing it.

3. Direction Change: Gears are employed to change the running direction of a shaft, providing versatile functionality.

Evaluation:

1. (a) Define Gear.

(b) List three types of gears and their respective uses.

2. State the primary uses of gears.

3. Enumerate the methods of gear lubrication.

**GENERAL EVALUATION**

1. Mention three (3) types of gear and their applications.
2. Sketch a spur gear.

**WEEKEND ASSIGNMENT**

1. ………. are used for transmitting drive between parallel shafts (a) Bevel gears

(b) Spur gears (c) Rack and pinion gears (d) Lift

2. Which of the following is used for transmitting power/drive between shafts at angles (a) Spur gears (b) Leaf gears (c) Rack and pinion gears (d) Bevel gears

3. In Rack and Pinion gears,……… generate rotary motion (a) rack (b) spur

(c) lift (d) pinion

4. A wheel with teeth around its rim that mesh with the teeth of another wheel to transmit motion is called (a) Belt (b) Chain (c) Gear (d) Clutch

5. ……… are used to change the speed of shafts to either high or low speed(a) Chain

(b) Belt (c) Clutch (d) Gear

**THEORY**

1. What is a Gear? (b) State three uses of gears

2. State three types of gears (b)Briefly describe the operation of gears

# WEEK FIVE

**TOPIC: GEARS II**

**CONTENT**

* Gear Ratio
* Gear Speed

**GEAR RATIO**

Gear ratio is defined as the ratio of number of teeth of output to input gear or input speed relative to output speed. It is calculated by dividing the number of teeth on the driven gear by the number of teeth on the driver gear.

Gear ratio= Number of teeth on the driven gear

|  |
| --- |
| Number of teeth on the driver gear |

Example: Calculate the gear ratio if a gear with 15 teeth is used to drive a gear with 30 teeth.

Gear ratio= Number of teeth on the driven gear= 30/15= 2/1

|  |
| --- |
| Number of teeth on the driver gear |

Gear ratio= 2:1

**Ratio of a Series of Gears**

When power flows through a series of gears, the ratio can be calculated in a similar manner. For example, if a 20-tooth driver gear drives a 24-tooth cluster gear, and the second speed cluster gear has 16 teeth driving a 20-tooth second speed driven gear, this could be calculated as follows:

Driven/Driver x Driven/Driver= 24/20 x 20/16= 1:5:1

**GEAR SPEED**

Gear speed is a measurement of how quickly a gear spins, often in a relation to the rotations of other gears. The speed of rotation of a gear is directly proportional to the number of teeth of the gear. For example, the speed of a 5-tooth gear will be twice the speed of a 10-tooth gear.

Example: A gear has 20 teeth. Its speed of rotation is 10 rpm. The gear drives another gear with 10 teeth. Determine the speed of the 10-tooth gear.

Solution

20 teeth x 10 rpm= 10 teeth x X rpm

X rpm= 20 teeth x 10 rpm/10 teeth

X rpm= 20 rpm

**EVALUATION QUESTIONS**

1. What is gear ratio?
2. Explain gear speed

**GENERAL EVALUATION**

1. Calculate the gear ratio if a gear with 20 teeth is used to drive a gear with 40 teeth.
2. A gear has 10 teeth. Its speed of rotation is 20rpm. The gear drives another gear with 15 teeth. Determine the speed of the 15-tooth gear.

**WEEKEND ASSIGNMENT**

1. Calculate the gear ratio if a gear with 12 teeth is used to drive a gear with 16 teeth. (a) 4:3 (b) 3:4 (c) 2:1 (d) 1:2
2. A gear has 15 teeth. Its speed of rotation is 25rpm. The gear drives another gear with 25 teeth. Determine the speed of the 25-tooth gear. (a) 10rpm (b) 20rpm (c) 15rpm (d) 30rpm
3. The ratio of input speed relative to output speed is…… (a) gear speed (b) gear ratio

(c) gear decimal (d) gear fraction

1. The speed of rotation of a gear is ……………. to the number of teeth of the gear (a) equal (b) unequal (c) inversely proportional (d) directly proportional
2. ………. is a measurement of how quickly a gear spins (a) gear ratio (b) gear speed

(c) gear decimal (d) gear fraction

**THEORY**

1. Explain (a) Gear Speed (b) Gear Ratio
2. (a) A gear has 32 teeth. Its speed of rotation is 4rpm. The gear drives another gear with 8 teeth. Determine the speed of the 8-tooth gear.

WEEK SIX

**TOPIC: HYDRAULICS AND PNEUMATIC MACHINES**

**CONTENT**

* Definition
* Types
* Uses

**Definition - Hydraulics and Pneumatics**

Hydraulics pertains to the scientific and technological field focused on the transmission of liquids through pipes and channels, often as a source of mechanical force or control. Conversely, when compressed air or gas is the fluid in question, it falls under the category of Pneumatics. Notably, hydraulic systems typically operate at substantially higher pressures compared to pneumatic systems, enabling them to generate significantly larger forces and torque.

**Simple Hydraulic and Pneumatic Machines**

1. Simple Force Pump: These pumps facilitate the movement of gases and liquids by applying pressure greater than that exerted by the substances they transport. A basic example is the bicycle pump, which propels air into bicycle tires. Another is the suction pump, employed for lifting liquids from lower levels.

2. Centrifugal Pump: Comprising moving vanes, this pump efficiently moves fluids, be it air or water, from a smaller radius to a larger one.

3. Hydraulic Jack: Utilizing the displacement of liquid into a high-pressure chamber, hydraulic jacks are designed to lift substantial loads, such as vehicles.

4. Garden Sprinkler: This device consists of water jets that can rotate around a central point, dispersing water across lawns or gardens.

5. Reaction Turbine: An advanced mechanical device designed to harness hydraulic power for various applications.

6. Waterwheel: A classic yet effective device that has been employed for centuries to convert the energy of flowing water into mechanical work.

**Uses/Applications of Pneumatics**

1. Air brakes on buses, trucks, and trains.

2. Air compressors.

3. Air engines for pneumatically powered vehicles.

4. Pressure sensors.

5. Pressure regulators and switches.

6. Vacuum pumps, among other applications.

**Uses/Applications of Hydraulics**

1. Hydraulic presses, crucial in various manufacturing processes.

2. Vehicle braking systems in cars, motorcycles, and bicycles, where hydraulic systems enhance braking efficiency.

3. Office chairs equipped with hydraulic mechanisms for height adjustment and reclining.

4. Boats and airplanes employ hydraulic systems for various functions, including landing gear operation.

5. Heavy machinery such as excavators and dump trucks employ hydraulic pistons to control equipment**.**

**Evaluation**

1. (a) Define (a) Hydraulics (b) Pneumatics.

2. Enumerate five (5) hydraulic and pneumatic machines.

3. List five (5) applications of Hydraulics and Pneumatics.

**General Evaluation**

1. Differentiate between Hydraulic and Pneumatic Systems.

2. Enumerate five (5) applications each of Hydraulics and Pneumatics.

3. List five (5) Hydraulic and Pneumatic devices.

**Weekend Assignment**

1. The branch of science and technology concerned with the conveyance of liquids through pipes and channels, especially as a source of mechanical force or control.

(a) Pneumatics (b) Hydraulics (c) Gearing system (d) Mechanical system.

2. Which of the following can be used to carry heavy loads such as a car?

(a) Centrifugal pump (b) Garden sprinkler (c) The waterwheel (d) Hydraulic Jack.

3. Examples of applications of pneumatics include the following except

(a) Pressure sensor (b) Office chairs (c) Vacuum pump (d) Pressure regulator.

4. The following are applications of hydraulics except

(a) Hydraulic press (b) Air compressor (c) Boats (d) Excavators.

5. Excavators and dump trucks use \_\_\_\_\_\_\_\_\_\_ to control their equipment.

(a) Hydraulic jack (b) Hydraulic press (c) Hydraulic pistons (d) Hydraulic fluid.

**Theory**

1. List five applications each of hydraulic and pneumatics.

2. State five types of hydraulic and pneumatic machines with their respective uses.

## **WEEK SEVEN**

TOPIC: BUILDING CONSTRUCTION: SITE PREPARATION I

Site preparation involves the removal of trees, demolishing buildings, removing any and all old underground infrastructures, and any other things that might affect the construction process in the future or hinder the project to be done.

In various building projects, site preparation is very essential. The site may be a thick bush with big trees or a swampy and waterlogged area or a site with small hills and valley covered with stones and rock, or even a site with old and abandoned buildings.

TYPICAL HAND TOOLS IN SITE PREPARATION

Among the typical hand tools in site preparation operations are:

1. Spade: Used for digging relatively loose or soft earth
2. Shovel: Used for lifting and throwing loose materials (aggregates) or soft earth into another position and for spreading and leveling the earth.
3. Matchet: Used for cutting grasses or wood like tree branches and shrubs
4. Hoe: Used for digging usually about the surface level of the ground.
5. Axle: Used for cutting bigger branches.
6. Chain saw: Used for felling trees and for cutting the trunk into smaller lengths

MECHANICAL TOOLS USED IN SITE PREPARATION

Mechanical tools, which are also very valuable in speedy operations of site clearing, tackle the bulk of the heavy jobs on the site. Among these are following:

1. Bulldozer: This is a very powerful machine, which can push down almost any obstacle on its way and clear them from the site.
2. Tractor shovel (pay loader): This machine has a tipping bucket at the front. It is used for lifting large quantities of loose materials at a time and loading them into trucks or tippers.
3. Grader is used mainly for grading, that is, for trimming of bank or edges of roads and for cutting ditches

REMOVAL OF VEGETABLE SOIL SMALL TREES AND SHRUBS

The bulldozer is moved in to push down unwanted structures like old buildings and to uproot trees and shrubs. This debris is moved away to the site where parts of the trees are later salvaged for firewood. The bulldozer then scraps or excavates the topsoil to a depth of between 150mm and 300mm for the entire surface area of the site.

To prevent weed growth, an herbicide is applied. Herbicide is chemicals that are capable of preventing the growth of weeds when applied on a building site.

Herbicides

1. Round up*:*This is a general-purpose herbicide
2. Grammazon*:*This is another trade name for a type of herbicide used on building site.

Techniques for Grubbing out roots and stumps

It is better to first fell the trees, cut the trunk and transport to the sawmill for conversion into timber. The stump left is then tackled. Some digging is done around the tree stump to expose the roots, which are then cut either with an axe or the chain saw and the stump finally pulled out by the bulldozer.

LEVELING THE SITE

When all the tree stumps and roots have seen grubbed out and the top vegetable soil excavation to a depth of between 150mm and 300mm, a grader is moved in, to level the site. Here, earth is cut from the higher ground and moved down to fill valleys, holes and gullies.

EXTERMINATION OF TERMITES AND THEIR NESTS

When termite’s nests and anthills are found on the construction site they should be destroyed. The anthill is knocked down and some poisonous chemicals like Gamaline or antitermite chemicals are mixed and poured into the nest to kill the termites.

GENERAL EVALUATION

1. Explain Site Preparation
2. State five (5)tools used in site preparation

WEEKEND ASSIGNMENT

1. Which of the following is not a hand tools for site preparation? (a) spade (b) shovel

(c) axle (d) grader

1. Which of the following is a mechanical tool used in site preparation? (a) matchet

(b) bulldozer (c) chain saw (d) hoe

1. Which of the following is used for lifting large quantities of loose materials at a time and loading them into trucks or tippers? (a) grader (b) bulldozer (c) matchet (d) chain saw
2. One of the anti-termite chemicals used to exterminate termites from sites is (a) Marline (b) Gamaline (c) Benzene (d) Ester
3. Which of the following chemicals is used for general purpose prevention of the growth of weeds (a) Round up (b) Grammazon (c) Gamaline (d) Benzene

THEORY

1. Explain the following processes (a) Techniques for Grubbing out roots and stumps

(b) Leveling the site.

1. State the uses of three (3) mechanical tools used in site preparation

**WEEK EIGHT**

TOPIC: SETTING OUT

Before embarking on constructing a building, individuals typically engage an architect to determine the need and type of structure required. The architect then provides an architectural design, which is subsequently handed over to a structural engineer. The structural engineer assesses and specifies the strength and type of building materials necessary. Following this, a quantity surveyor examines the working drawings of the proposed building to estimate the costs associated with materials, labor, and workmanship. Finally, a construction company secures the contract for building the structure.

SETTING OUT

The construction process commences with "setting out." Setting out is the initial stage where wooden pegs are strategically driven into the ground, aligning with the dimensions specified in the architect's drawings. It involves the precise transfer of foundation plan details from the drawing sheet onto the ground using pegs, lines, and tapes.

Key working drawings include:

1. The floor plan.

2. The elevations.

3. The sections.

4. The detailed drawing.

5. The schedules.

6. The electrical plan.

7. The plumbing plan.

Several tools are employed for setting out, including:

1. Steel rule.

2. Builder's square.

3. Theodolite.

Once the concrete footing for the foundation is cast and cured, lines are established for the wall's thickness and plumbed down to the concrete footing. Subsequently, the initial course of the concrete block wall is laid.

EVALUATION

1. What is setting out?

2. Enumerate the tools used for setting out.

EXCAVATION

After transferring the foundation plan to the site through setting out, the excavation phase commences. For large structures like stadiums or multi-storey buildings, mechanical excavation might be employed to dig trenches for column or wall foundations. Mechanized boring is used where bored piled foundation is recommended.

TIMBERING

Timbering involves supporting the excavated pit's walls with timber to ensure safety during construction.

CONCRETE AND ITS MATERIALS

Concrete is a composite material consisting of a binding material (cement), fine aggregate (sand), and coarse aggregate (stone), mixed thoroughly with water. Concrete is renowned for its durability, resistance to decay, moisture, corrosion, and fire. Reinforced concrete incorporates steel rods or welded wire mesh for added strength.

Ideal concrete should be strong, durable, hard, dense, non-porous, fire-resistant, and cost-effective.

EVALUATION QUESTIONS

1. Define (a) Excavation (b) Timbering.

2. Mention the materials used in making cement.

GENERAL EVALUATION

1. Define the following: (a) Excavation (b) Timbering (c) Setting out.

2. Enumerate the elements involved in working drawings.

WEEKEND ASSIGNMENT

1. The process of supporting the walls of the excavated pit with timber is (a) excavation (b) timbering (c) concrete (d) coarse aggregates.

2. Which of the following is not used for setting out right-angled triangles and squaring? (a) Steel square (b) Builder's square (c) Concrete (d) Theodolite.

3. Which of the following is not a required characteristic of good concrete? (a) Strong and hard (b) Durable and fire-resistant (c) Non-porous and economical (d) Weak and poor.

4. The process of transferring, with a high degree of skill and accuracy, the details of the foundation plan from the drawing sheet onto the ground using pegs, lines, and tape is called (a) Timbering (b) Working drawing (c) Setting out (d) Site preparation.

5. Which of the following professionals plans and designs a building to meet the client's wishes and needs? (a) Quantity surveyor (b) Structural engineer (c) Architect (d) Plumber.

THEORY

1. Define (a) Setting out (b) Timbering (c) Excavation.

2. Identify and discuss six (6) working drawings used in building construction.

**WEEK NINE**

**TOPIC: TAPS AND WATER SUPPLY**

**CONTENT**

* Definition of Tap
* Types of Taps
* Water Supply/ Plumbing/Fitting

**Definition of Tap**

A tap is a valve controlling the release of a liquid or gas. Taps are made using a wide range of materials, including stainless steel, chrome, brass, nickel and gold.

**Types of Taps**

They are three main varieties of washerless tap available nowadays these are

* + - 1. Ball taps: This work by pushing a hollow plastic or stainless steel ball over a rounded cover, which controls the temperature and flow of water.
      2. Cartridge Taps: These have a lever controlling a plastic or brass cartridge which moves up and down to restrict flow and from left to right to change temperature.
      3. Ceramic disc Taps: This have two ceramic plates which slide over each other to regulate temperature and flow and require the least maintenance out of all the types.

**Tap Styles**

Cross head tap

Lever tap

**How Taps Work**

Different taps also regulate the water in different ways. Many of us are familiar with the compression type of tap – when the tap is screwed down it compresses a washer made of rubber or neoprene against a metal seat, which restricts and water flow. These washers will wear out over time, and need to be replaced

**Water Supply/Plumbing**

**Definition of plumbing**

**Plumbing** can be defined as the system of arranging and connecting pipes with others things (fittings and machines) that supply water to and drain liquids wastes out of the building.

**Domestic pipeline fitting has the following components**

1. Stops Corks
2. Drain Corks
3. Valves (gates valves bul-valves)
4. Taps
5. Elbows
6. Tees
   1. **Stop Cork:** This is used to control the flow of water through water supply pipes.
   2. **The Stop Cork** has a crutch handle, which is turned clockwise or anticlockwise to raise or lower the jumper on valve seating.
   3. **Drain Cork:** It is connected to a water supply pipe in order to drain off water.
   4. **Gate valve:** It is a valve that is used in controlling the flow of water in the distribution pipes.
   5. **Taps**: We get supply by opening a tap at the end of the supply line.
   6. **Elbows:** These are connected to the water supply pipe to change the direction of flow through an angle. For example, it is important when a horizontal pipe is to be connected to a vertical pipe. One end of the elbow turns through the required angle (90, 112½ , 135 , 157½ )
   7. **Tee:** A tee is used for joining three pipes meeting at a junction from one of the pipes the flow divides into the two other pipes.

**EVALUATION**

1. Define (a) Tap (b) Plumbing
2. State three (3)types of tap
3. Explain five (5) domestic line fitting and state their uses.

**PIPELINE SYSTEM FOR DOMESTIC WATER SUPPLY**

Pipes referred to as the mains are laid underground to distribute water to various outlets. The water from the street mains enters the compound of a building in a 30m-diameter pipe (community pipe). It connects to a side of the water authority stop cork which buried in a pit at least 80cm deep.

The main pipes are laid underground to distribute water to various outlets. The main is connected to the kitchen sink to outside tap and up to the elevated tank. Baths, water closet, washing hand basin and hot water system are supplied directly by gravity through a 22m diameter pipe from the overload storage tank.

**WATER STORAGE TANK**

Water storage tank is important when one considers the fact that regular supply of water cannot be guaranteed. Storage tank is important because:

1. The demand for water varies during the day from the peak period demand in the morning to low demand later in the evening.
2. Water is distribute from the storage tank generally at low pressure, thus if there is a leakage along the supply line, It will not as serious as leakage along the high-pressure supply mains.
3. There are occasions when the water authority has to cut off supply to effect repairs unless one has a storage tank there will be no supply to the building.

**SINKS**

They are made from stainless steel or enameled steel. Sinks are provided with piller bib taps depending on the orientation of water supply pipe. It has over flown hole to provide passage for water in case of the tap being carelessly left open. A’s tipper is used to block the water passage when the tap is open to provide a pool of water for washing.

When blockage occurs, a sink plunger down or a force cup may be used. The plunger placed over the waste outlet is then plunged down forcibly as many times as necessary.

The plunging action generates a lot of compressive force, which moves the obstruction out of the way. If the plunging fails to remove the blockage the clearing “ey” will have to be unscrewed. A wire can then be used to probe into the piping to dislodge the offending materials.

**BASINS**

Wash basins are usually made of ceramic. It has almost the same component as the sinks.

**BATH TUBS AND SHOWERS**

Baths are of different sizes and shapes. They are made of enameled cast iron or acrylic plastic. Cold water taps as well as hot water tap is provided. It also has a stopper to stop water flow as often required.

For a body wash, there is a great advantage in installing a shower:

1. It ensures economical use of water than a bath tub.
2. Showers are more hygienic.

**WATER CLOSET**

The water closet is one of the most important components of a household’s plumbing installation.

Human wastes are got rid of through the W.C. Any malfunctioning will lead to an unhealthy environment. The cisterns contain at least two gallons of water.

**HOT WATER SYSTEM**

Hot water system is required mainly for providing warm water for bathing and for brushing the teeth at washbasin. This can be achieved. This can be achieved by installing an electric water heating system. The hot water is piped to the bathtub and washbasin.

**EVALUATION**

* + - 1. Define (a) Taps (b) Sinks (c) Basins
      2. State the types of taps we have

**THE DRAINAGE SYSTEM**

The importance of drainage cannot be over-emphasized. A drainage system must be provided with a pipe to get rid of liquid waste from kitchen sink, the bathtub, and the wash hand basins, water closets.

The effluents flushed from the W.C travel through the ‘soil’ pipe into the inspection chamber, which constituted the junction for all drains. The water drained from the water basins travel through a separate pipe first into a gulley where in solids are removed before the drain enters into the inspection chamber,

After the inspection chamber, the liquid waste either goes into the public sewage works or a septic tank. The septic tank is an underground chamber into which sewage from the house enters and leaves as clean effluent. The inlet of the septic tank is slightly higher than the outlet, this is to ensure that when fresh discharge of sewage enters the tank, an equal volume of old liquid in the tank is displaced into the filter tank, anaerobic bacteria (bacteria which cannot live in the pressure of free oxygen) act on the sewage to break down the solids to liquid, gas and mineral sludge.

The liquid effluent from the tank enters the second chamber or filter tank where aerobic bacteria (bacteria which live in the presence of oxygen) complete the sewage purification process by oxidation.

For septic tank to be able to perform the above-mentioned point, than these practice should be noted.

1. The use of disinfectants destroyed the disease germs in a toilet and at the same time destroy the bacteria in the septic tank, thus it slows down the bacterial action in the waste.
2. Household chemicals like bleaches, detergents etc when used excessively and sent into the septic tank interfere with the bacteria decomposition of waste. The rate of absorption of the soil is thereby reduced liquid effluent from the soil may then find its way to the surface consequence the surrounding area get polluted.
3. The empty of large volume of water may result in the churning up of the solids that are still being broken down by bacterial action as well as the sludge. Such products may also flow into the filter or drainage field to cause clogging
4. It is important to establish the absorption properties of soil in an area where septic tank is to be installed.

**GENERAL EVALUATION**

1. Explain the following

* 1. sink
  2. water closet
  3. storage tank

2. Mention three practices to be noted in the use of septic tank in our home.

**WEEKEND ASSIGNMENT**

1. The system of arranging and connecting pipes with others things (fittings and machines) that supply water to and drain liquids wastes out of the building is called\_\_\_ (a) plumbing (b) bricklaying (c) rendering (d) setting out
2. The following are components of domestic pipeline fitting has the following except (a) Drain Corks (b) Valves (gates valves bul-valves) (c) Elbows (d) bore hole
3. Which of the following is used to control the flow of water through water supply pipes? (a) Drain Cork (b) Stop cork (c) Elbow(d) bore hole
4. Which of the following is used to get rid of human wastes? (a) the Water Closet

(b) bath hub (c) storage tank (d) sink

1. The system that is used to get rid of liquid waste from kitchen sink, the bathtub, the wash hand basins and water closets is called\_\_\_ (a) A drainage system (b) liquid system (c) power system (d) cleaning system

**THEORY**

1. Define the following terms A. Plumbing B. Tap C. Sink
2. Explain five (5) domestic line fitting and state their uses.

WEEK TEN

TOPIC: Practical Projects

Choose one of the following project areas:

* + - Wood work
    - Metal work
    - Building construction
    - Electricity