

THIRD TERM E-LEARNING NOTE

SUBJECT: BASIC TECHNOLOGY
JSS2

CLASS:

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
2. Opposite sides of a parallelogram are ____ (a) diagonal (b) parallel (c) vertex (d) straight
3. ____ is a plane figure enclosed by three straight lines (a) Triangle (b) Quadrilateral (c) Pentagon (d) Heptagon
4. An octagon is a polygon with ____ sides ____ (a) 5 (b) 6 (c) 7 (d) 8
5. The sum of angles in a quadrilateral is ____ (a) 90 (b) 180 (c) 270 (d) 360
6. What is the center rule formula used to construct a polygon? (a) $360 - N$ (b) $360 \times N$ (c) $360/2$ (d) $360 + N$
7. A regular polygon has ____ of its sides and angles equal (a) five (b) all (c) three (d) four
8. The opposite angles in a parallelogram are ____ (a) equal (b) unequal (c) positive (d) negative
9. Plane figures are identified by the number of ____ enclosing them (a) points (b) sides (c) values (d) circle
10. A line that joins two opposing corners of a quadrilateral is called ____ (a) plane (b) diagonal (c) angle (d) vertex
11. Each angle in a regular pentagon is ____ (a) 60 (b) 72 (c) 82 (d) 92
12. 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
13. 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
14. 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

15. Which of the following is not a type of scale drawing? (a) Reduced (b) Enlarged (c) Extended (d) Full
16. A quadrilateral with only two parallel sides is called ____ (a) square (b) rectangle (c) trapezium (d) kite
17. Which of the following is used to rotate the work and transmits movement to saddle of a lathe? (a) the bed (b) the headstock (c) the saddle cross slide (d) main spindle
18. The following are work holding methods except (a) catch and carrier (b) face plate (c) saddle (d) chuck
19. 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
20. 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
21. The space occupied by a plane figure is called ____ (a) diagonal (b) area (c) volume (d) theorem
22. The lubricant commonly used in transmission system is (a) diesel (b) gear oil (c) grease (d) hydraulic
23. Constant lubrication of a machine is to prevent (a) corrosion (b) exhaustion (c) high speed (d) sulphation
24. Which of the following will not reduce friction? (a) lubrication (b) use of rollers (c) use of pulleys (d) drying
25. Which of the following is not a practical application of friction? (a) belt drive (b) cable drive (c) chain drive (d) clutches
26. MRO stands for (a) Machine, relevance and operations (b) Maintenance, repair and operations (c) Maintenance, relevance and organization (d) Machine, repair and organization
27. Which of the following is not a part of lathe machine? (a) head stock (b) main spindle (c) steadies (d) shaper
28. Which of the following triangles has none of its side equal A. Equilateral B. Scalene C. Isosceles D. Right-angled
29. The rougher the surfaces in contact, the the frictional force (a) greater (b) lesser (c) partial (d) equal
30. 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

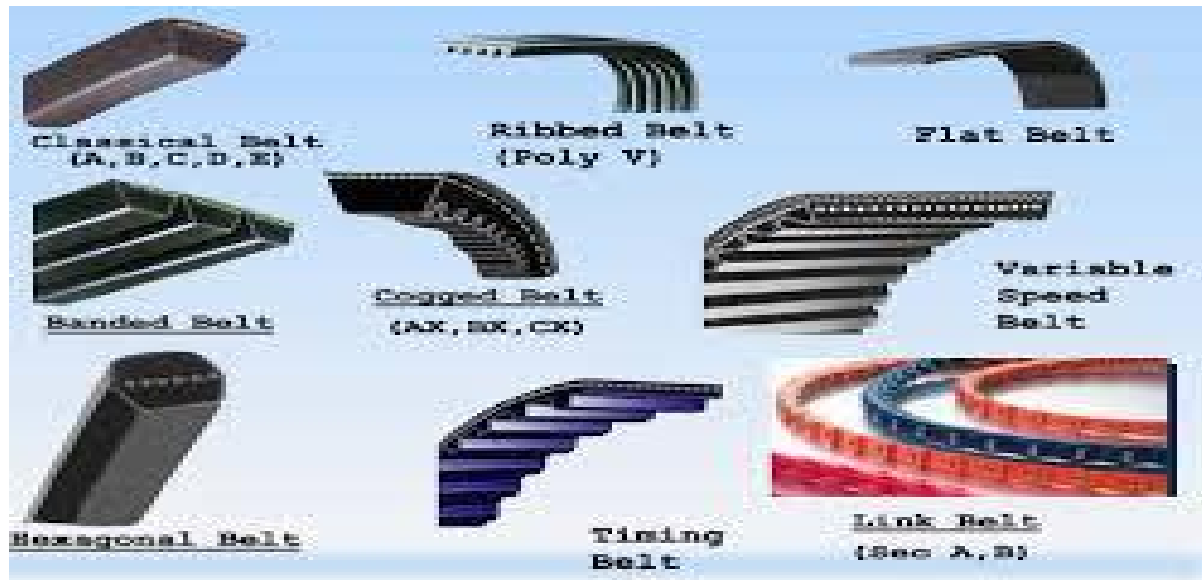
The types of belt drives are diverse. The list of its kinds include the flat belts, synchronous timing belts, cog belts, vee-belts, round belts, multi-groove belts, ribbed belts, film belts, metal belts, endless round belts and speciality belts. Some of them are explained below:

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 friction between the belt and the sheave.
2. **Synchronous Belts, or Timing belts:** These ride on sprockets 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

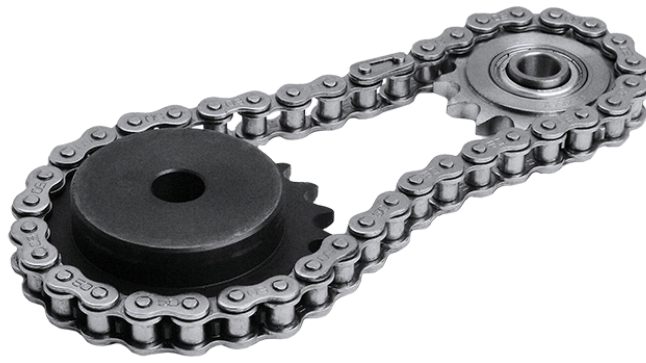
CHAIN DRIVES

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

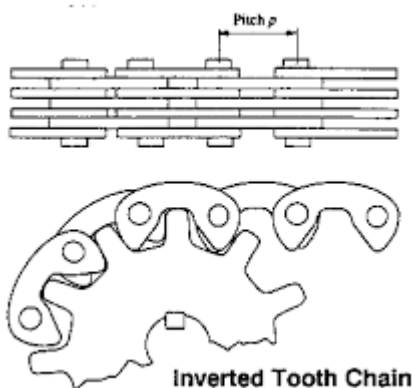
1. **Roller Chain Drives:** The most common type of chain is the roller chain, in which the roller on each pin provides exceptionally low friction between the chain and the sprockets. Roller chain is classified by its pitch, the distance between corresponding parts of adjacent links. The pitch is usually 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 be 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

READING ASSIGNMENT: Read more on belt and chain drives (NERDC Basic Tech. for JSS3 page 148-153)

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 (CONTD.)

CONTENT

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

ADVANTAGES OF BELT DRIVES

1. Belt drives are simple and economical
2. They don't need parallel shafts
3. Noise and vibration are damped out
4. They are lubrication-free
5. They are provided with overload and Jam protection
6. They are highly efficient in use (up to 98%, usually 95%)

DISADVANTAGES

1. They can slip or stretch which makes the angular velocity ratio not necessarily constant
2. Heat buildup occurs
3. Operating temperatures are usually restricted to -35 to 85°C
4. Adjustment of center distance or use of an idler pulley is necessary for wearing and stretching of belt drive compensation

ADVANTAGES OF CHAIN DRIVES

1. Chain drives do not slip or creep, and so are more efficient than belt drives
2. They are more compact than belt drives
3. They are often easier to install than belt drives
4. They do not deteriorate due to oil, grease, sunlight, or age
5. Operate effectively at high temperatures

6. Can withstand abrasive conditions
7. Can operate in wet conditions
8. Can be used on reversing drives

DISADVANTAGES

1. The production cost of chains is relatively high
2. Require more precise alignment than belt drives
3. Typically require frequent lubrication
4. Are noisy and can cause vibrations
5. Cannot be used in applications where the drive must slip
6. Do not have the load capacity or service life of gear drives

EVALUATION QUESTION

1. State 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 in rigging 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

1. Belt drives are made up of polymers
2. They can operate under high speed conditions
3. They do not need lubrication
4. They need dry condition to work properly
5. They make noise
6. They are powered by a belt

Chain Drives

- Chain drives are made of alloys
- Chain drives can operate under high load
- They need lubrication
- They can work in high temperature and moist condition
- They make noise
- 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

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

READING ASSIGNMENT

Read about Gears (NERDC Basic Tech. for JSS3 page 154-156)

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

A gear is a wheel with teeth around its rim that mesh with the teeth of another wheel to transmit motion.

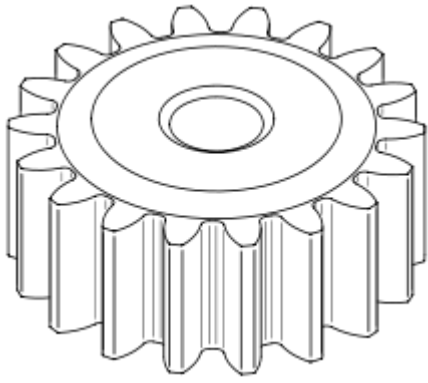
OPERATION

When two gears mesh, one is the driver and the other becomes the driven. A gear is a driver gear because the power to drive the system is generated by it, while the other is the driven because it is only being driven, and does not produce the power/energy.

TYPES OF GEAR

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

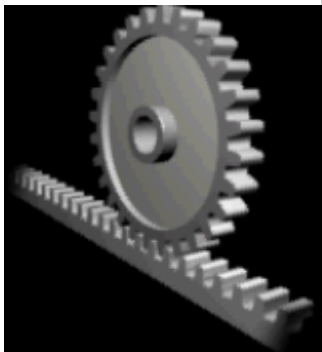
1. **Spur gears:** They are used for transmitting drive between parallel shafts.



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



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



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.

LUBRICATION OF GEARS

Lubrication is the application of oily or greasy substance to machine parts in order to reduce friction. The substance applied (such as oil or grease) is called lubricant.

The purpose of lubricating gears is as follows:

1. To promote sliding between teeth to reduce the coefficient of friction
2. To limit the temperature rise caused by rolling and sliding friction.

Methods of Lubrication

There three gear lubrication in general use

1. Grease lubrication
2. Splash lubrication (oil bath method)
3. Forced oil circulation lubrication

There is no single best method or lubricant. Choice depends upon tangential speed and rotating speed. At low speed, grease lubrication is a good choice. For medium and high speeds, splash lubrication and forced oil circulation are more appropriate, but there are exceptions. Sometimes, for maintenance reasons, a grease lubricant is used even with high speed.

USES OF GEAR

1. Gears are used to transmit power from one shaft to another.
2. They are used to change the speed of shafts to either high or low speed.
3. They also change the running direction of a shaft.

EVALUATION

1. Define (a) Gear (b) List three types of gear and the uses
2. State the uses of gear
3. State the methods of gear lubrication

GENERAL EVALUATION

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

READING ASSIGNMENT

Read about gear ratio and gear speed (NERDC Basic Tech. for JSS3 page 157-159)

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 (CONTD.)

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 = $\frac{\text{Number of teeth on the driven gear}}{\text{Number of teeth on the driver gear}} = \frac{30}{15} = 2/1$

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 = $24/20 \times 20/16 = 1.5:1$

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.

READING ASSIGNMENT

Read about hydraulics and pneumatic machines (NERDC Basic Tech. for JSS3 page 170-180)

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
4. 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
5. 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 is 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. When **compressed air (gas)** is the liquid, it is called Pneumatics. Hydraulic systems tend to be used at a much higher pressure than pneumatic systems. Consequently, the former can produce much larger forces and torque than the latter.

SIMPLE HYDRAULIC AND PNEUMATIC MACHINES

1. Simple Force Pump: Pumps are used to move gases and liquids by applying pressure greater than those of the gases or liquids. The simplest pump is the bicycle pump that moves air through the pump to the bicycle. Another simple pump is the suction pump. It is used for lifting liquids from a low level.
2. Centrifugal pump: This has a set of moving vanes which receive the the fluid (air or water) at a smaller radius
3. Hydraulic Jack: The discharge action in the hydraulic jack moves the liquid into a high pressure compartment. The piston is equipped to carry heavy loads such as cars.
4. Garden sprinkler: This consists of one or more water jets which can revolve about the center as it sprinkles water in a lawn or garden.
5. Reaction turbine
6. The waterwheel

USES/APPLICATION OF PNEUMATICS

1. Air brakes on buses, trucks and trains
2. Air compressors
3. Air engines for pneumatically powered vehicles
4. Pressure sensor
5. Pressure regulator and switch
6. Vacuum pump etc

USES/APPLICATION OF HYDRAULICS

1. Hydraulic Press
2. Breaks in cars, motorbikes and bicycles often use hydraulic systems to force to break pads
3. Office chairs
4. Boats and airplanes
5. Excavators and dump trucks use hydraulic pistons to control their equipment

EVALUATION

1. Define (a) Hydraulics (b) Pneumatics
2. State 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. State five (5) applications each of Hydraulics and Pneumatics
3. List five (5) Hydraulic and Pneumatic devices

READING ASSIGNMENT

Read about Site Preparation (NERDC Basic Tech. for JSS2 page121-123)

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 car?
(a) Centrifugal pump (b) Garden sprinkler (c) The waterwheel (d) Hydraulic Jack
3. Examples of application of pneumatic 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) hydraulicjack (b)hydraulic press(c)hydraulic pistons (d) hydraulic fluid

THEORY

1. List five application each of hydraulic and pneumatics
2. State five types of hydraulic and pneumatics machine with their 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. **Axe:** 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 been 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

READING ASSIGNMENT

Read about Setting out (NERDC Basic Tech. for JSS2 page 123-126)

WEEKEND ASSIGNMENT

1. Which of the following is not a hand tool for site preparation? (a) spade (b) shovel (c) axe (d) grader
2. Which of the following is a mechanical tool used in site preparation? (a) machete (b) bulldozer (c) chain saw (d) hoe
3. 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) machete (d) chain saw
4. One of the anti-termite chemicals used to exterminate termites from sites is (a) Maline (b) Gamaline (c) Benzene (d) Ester

5. 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.
2. State the uses of three (3) mechanical tools used in site preparation

WEEK EIGHT

TOPIC: SETTING OUT

Anybody wishing to construct a building usually first consult an architect on the need for a building and the type of building wanted. An architectural design is sent to the structural engineer, who determines and specifies the strength and type of building material to be used. The quantity surveyor studies the working drawing of the proposed building determines the cost of materials, labour and workmanship. Finally, a construction company wins the contract for the construction of the building.

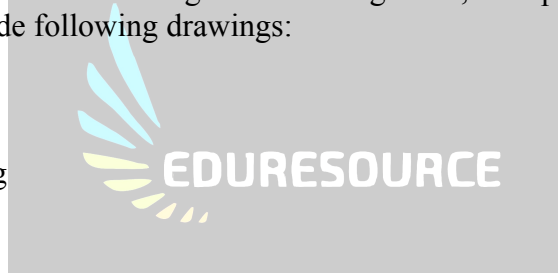
SETTING OUT

Building construction start with setting out

Setting out is, therefore, a process of driving wooden pegs into the ground here and there, in a manner that agrees with the dimensions of the building specified on the architect's drawings. Setting out is also the process of transferring with high degree of skill and accuracy, the detail of the foundation plan from the drawing sheet on the ground, with pegs, lines and tapes.

Working drawings include following drawings:

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



The following tools are used for setting out

1. Steel rule
2. Builder's square
3. Theodolite

When the concrete footing for the foundation has been cast and cured lines for the thickness of the wall are run and plumbed down to the concrete footing and the first course of the concrete block wall is laid.

EVALUATION

1. What is setting out?
2. Mention the tools used for setting out

EXCAVATION

When foundation plan for a building has been transferred on to the site, by way of setting out, excavation begins. For very big structures like stadium or a multi-storey building, the trenches for the column foundation or wall foundation can be mechanically excavated. Holes are mechanically bored where bored *piled* foundation has been recommended.

TIMBERING

This is the process of supporting the walls of the excavated pit with timber, for the purpose of safety.

CONCRETE AND ITS MATERIALS

Concrete consists of a matrix or binding material (cement), fine aggregate (sand) and coarse aggregate (stone) mixed thoroughly with water. Concrete, therefore, is a composite material in which a binding material mixed with water on solidification binds the inert materials – the particles of well-graded fine and coarse aggregates. Green concrete is used in the construction of footings, foundations, slabs, columns, lintels, beams, steps, and walls. It resists decay, moisture and corrosion from acids. *REINFORCED* concretes are concrete having steel rods or welding wire mesh.

A good concrete should be strong, durable, hard, dense, non-porous, fire resisting and economical.

EVALUATION QUESTIONS

1. Define (a) Excavation (b) Timbering
2. Mention the materials used for making cement.

GENERAL EVALUATION

1. Define the following a) excavation b)timbering (c) setting out
2. Mention things involve in working drawings.

READING ASSIGNMENT

Read more on setting out (NERDC Basic Tech. for JSS2 page123-126)

WEEKEND ASSIGNMENT

1. The process of supporting the walls of the excavated pit with timber (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 expectation of a good concrete (a) strong and hard (b) durable and fire resisting (c) non-porous and economical (d) weak and poor
4. The process of transferring with high degree of skill and accuracy, the details of the foundation plan from the drawing sheet on to the ground with pegs, lines and tape. (a) Timbering (b) working drawing (c) setting out (d) site preparation
5. Which of the following professional plans and designs a building that satisfies the wishes and needs of the client? (a) Quantity surveyor (b) structural engineer (c) architect (d) plumber

THEORY

1. Define (a) setting out (b) timbering (c) excavation
2. State and discuss six (6) working drawings used by building worker.

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

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

1. Ball taps: These 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: These 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

1. Cross head tap
2. Lever tap

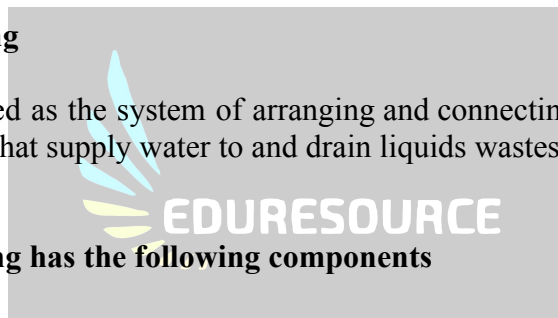
How Taps Work

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 other things (fittings and machines) that supply water to and drain liquid wastes out of the building.



Domestic pipeline fitting has the following components

1. Stop Corks
 2. Drain Corks
 3. Valves (gate valves ball-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 pillar 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
 - b. sink
 - c. water closet

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

READING ASSIGNMENT

Read more on taps and water supply

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
5. 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

