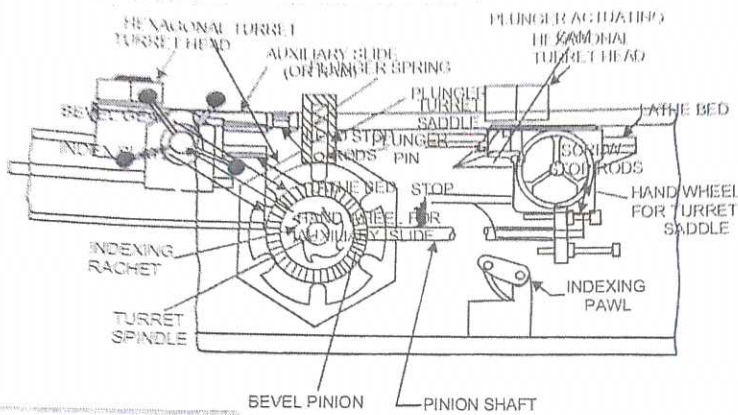


SCHEME OF VALUATION

(Scoring Indicators)

| Revision:(2015) | | Course code:6021 | | |
|---|---|------------------|-----------|-------|
| Course Title ADVANCED PRODUCTION PROCESSES | | | | |
| Qst No | Scoring Indicator | Split up score | Sub Total | Total |
| PART-A | | | | |
| 1 | It is a tool holding device shaped in the form of hexagon and is mounted on a ram (auxiliary slide). The specially designed tools are attached to six faces of hexagonal turret and are brought into position for different operations. | - | 2 | 2 |
| 2 | 1 Casting (a) Sand casting (b) Permanent mould casting (c) Die casting 2. Powder metallurgy 3. Plastic moulding 4. Stamping (Forming on power press) 5. Extruding 6. Coining 7. Rolling 8. Machining (a) Form cutting (Form milling, Broaching) (b) Template method (c) Generating (Gear hobbling, Shaping, Grinding) | Any 4x1/2 | 2 | 2 |
| 3 | 1. Oil base paints 2. Lacquer 3. Varnishes 4. Enamels 5. Bituminous paints 6. Rubber base paints | Any 4x1/2 | 2 | 2 |
| 4 | Changing demands, technological development and competition led to formulate new product design and manufacturing system. One of the important developments in manufacturing is the introduction of Flexible Manufacturing System. (FMS) | | 2 | 2 |
| 5 | Galvanising, Tin coating, Parkerising | 2x1 | 2 | 2 |
| PART-B | | | | |
| 1 | The plunger locks the index plate by spring pressure and prevents rotary movement when the turret is moving forward. During this advancement the tool held in the turret performs its operation. Now indexing of turret is done during backward motion of the turret. At backward position of turret, the actuating cam lifts the plunger out of the groove and unlocks index plate. This | fig | 3 | |

is surface of the cam. By this time, the spring loaded pawl engages with a groove of the ratchet plate causes the ratchet to rotate as the turret moves backward due to riding of the pin on the bevel. When the index plate (i.e., turret) rotates through one-sixth revolution, the pin and plunger drops out of the cam and plunger locks the index plate in the next groove. Thus the turret is indexed and locked in new position. The next tool is now fed forward and the pawl is released from the plate by the spring pressure



Explain

3

6

- 2 1-In broaching, the broach is pushed or pulled over a external flat surface of a stationary work piece.
- 2- In internal broaching the broach is pushed or pulled through the hole in the stationary work piece.
- 3-In certain machines, the broach is held stationary and the work piece translates over the broach.
- 4-For broaching no separate feed is required as the feeding action is in built in the teeth form. Each successive tooth is a little higher than the one preceding it. Therefore, each tooth removes a layer of work piece material. The first few teeth on broach are low to permit the small end of the tool to be passed through work. The intermediate teeth remove the most of the metal; and the last few teeth finish the surface to size.
- 5-Machining operation completes in one pass of the broach.

Any 3 Points

2

6

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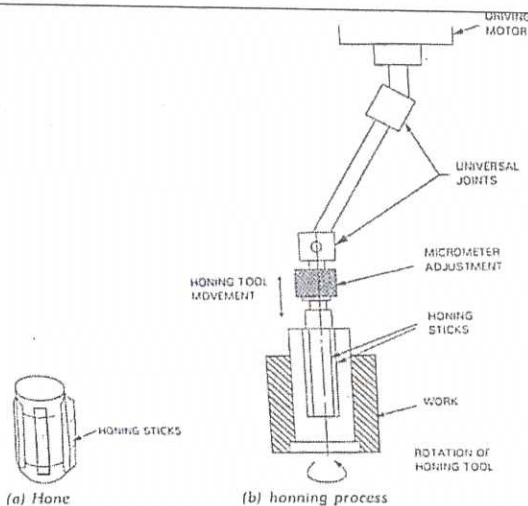


Fig 3

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Honing process : For honing, the hone is inserted into the hole and adjusted to bear against the walls. Work is kept stationary, and the metal is removed as a result of rotary as well

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| | | | | |
|---|---|-----|---|---|
| | <p>as reciprocating motion of the hone in the hole. A cutting fluid (kerosine) is used to remove chips and to keep temperature low. It is important to see that the hone should not leave the work surface and stroke length must cover the entire work length. Depending upon the work material, honing speed may vary from 0.25 to 1 m/s and honing pressure is in the range of 1 to 3 N/mm². Surface roughness obtained in this process is in the order of 0.1 to 0.8 mm. ceate on be Honing can be performed on lathe or drilling machine, but better results can be obtained on honing machines for production work.</p> | | | |
| 4 | <p>METAL SPRAYING 1-Wire method 2-Power method Wire method In wire method, the coating material is in the form of wire. It is melted by means of oxy-acetylene flame. The molten metal is fully atomised by using compressed air and atomised molten metal spray is projected on to a prepared work surface to form adherent coating metal is less expansive in wire form. It is more readily available and easily handled. However it requires gears to feed the wire through the tip into the flame as fast as it melts. With this method, the coating may be applied successfully not only to metals but also to glass, wood, asbestos and certain plastics. Powder Method : In powder method, coating metal is in the powder form and is fed container through a rubber hose to spray-gun. The powder-spray method an oxyacetylene welding torch with modified tip which permits the powered metals to be sprayed through the flame. A gas or compressed air covey the powder metal to the torch tip. Fuel gas can be acetylene or hydrogen. in ihis case, coating metal is already in the atomised form and hence air required to deposit the molten metal on the surface being coated. The equipment for powder method cost less. It has no gears and is lighter to handle. However the cost of metal powders is high and metal in the powder form is not readil available The powder method is mostly used for hard-facing. Powders used for coati are basically chromium-nickel compositions to which boron or silicon and phosphorus are added. The coating thickness ranges from 0.08 mm to 1.8 mm 3. If heavier deposits are required, a second pass is made. The coating forms a true bond, and can withstand abrasion, erosion, corrosion and heat.</p> | 2x1 | 2 | |
| | | 2 | 2 | 6 |
| | | 2 | 2 | |
| 5 | <p>1 In open loop system, actual motion of slider is not monitored (ie not provided with feedback) whereas in closed loop system the actual motion of slider is monitored by the feedback signal; and if any error detected it is automatically corrected. 2. Open loop system is less expensive than closed loop system. 3. Open loop system is less accurate than closed loop system. 4. Open loop system is applied to machines where there is no change in conditions, i.e., where the feedback is not required whereas closed loop system is applied to fully automatic machines.</p> | 4x2 | 6 | 6 |

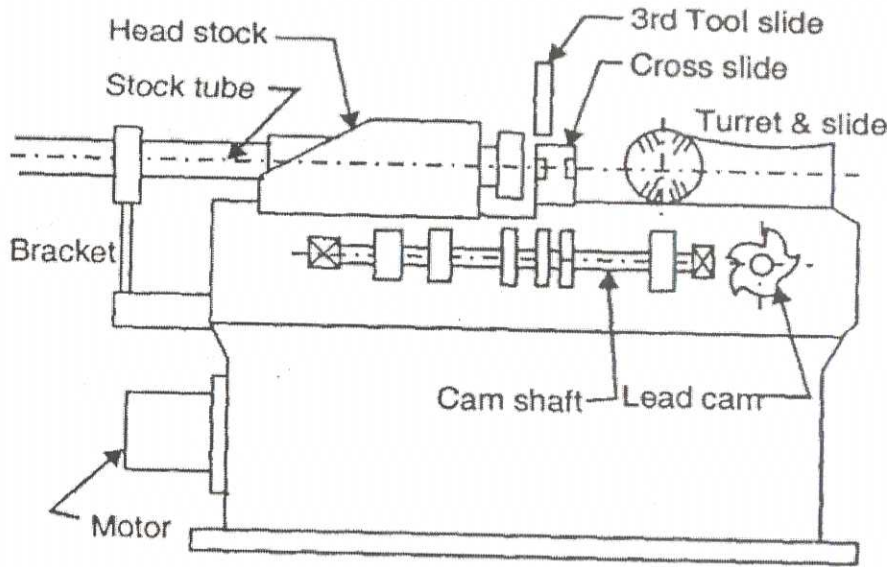
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|---|--|---|---|---|
| 6 | <p>Semi-Automatic Lathes: Semi-automatic lathes are production lathes in which, once the machine is setup, all the machining operations (all the movements relating to manufacturing cycle) are performed automatically but loading of work pieces and unloading of finished components are accomplished by the operator.</p> <p>Automatic Lathes: In automatic lathes all the movements related to the manufacturing cycle and also the loading of work pieces and unloading of finished parts are performed without attention of operator. Only it requires initial setup of the machines.</p> | 3 | | 6 |
| 7 | <p>1-Suitability of FMS for long term manufacturing and marketing strategy 2-Justification of heavy investment for given product 3-Optimisation of design and operation of FMS. 4-Risks and costs associated with development of software. 5-Selection of components and processes</p> | 6 | 6 | 6 |

PART-C

UNIT-1

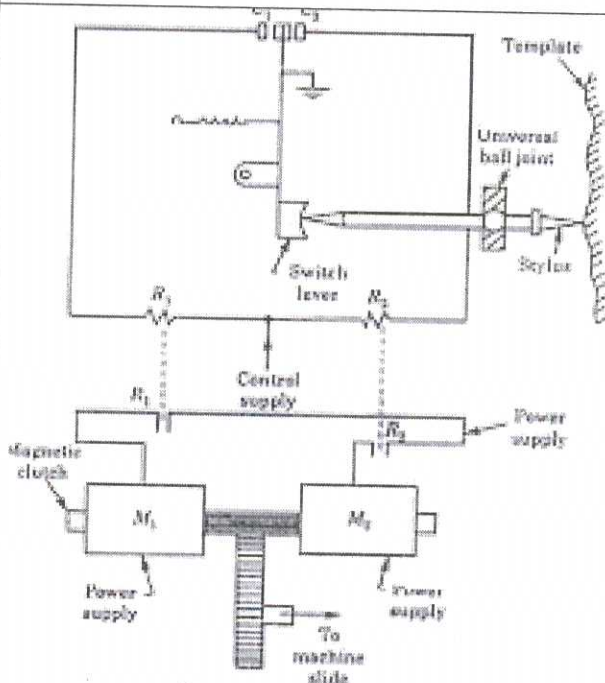
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|------|--|-----|---|---|
| IIIa | <p>1 The headstock of a turret lathe is heavier than the headstock of engine lathe and is provided with wider range of speeds 2. In turret lathe, the tailstock of an engine lathe is replaced by turret that holds six or more tools. In addition, a four way tool post on cross-slide and a rear tool post on carriage holds additional tools whereas in engine lathe only one tool is normally held in standard tool post, and for different operations tool must be changed. 3. In turret lathes two or more cutting tools are used simultaneously whereas in engine lathe only one tool is used as once 4 In turret lathes, each tool station is provided with feed stop (or feed strip) so that each cut of a tool is the same as previous cut. 5 In turret lathe rapid machining of any quantity of identical parts is possible with initial tool setup 6 Turret lathes are not usually fitted with lead screw and threads are normally cut by using die heads and taps. However a short length of screw (chasing screw) is sometimes provided for cutting threads by a chaser 7. In case of turret lathes, an extreme rigidity for holding of work and tools is built into permit multiple and combined cuts. 8 Turret lathes are suitable for mass production whereas engine lathes are economical for mass production.</p> | 8x1 | 8 | 8 |
| IIIb | <p>Automatic screw machines were originally designed for manufacturing bolts and screws from bar stock in mass production But they are now used for production of small parts of complex shape from bar stock .The bar is advanced through stock tube up to stop and is clamped in the rotating spindle by means of collet chuck. These machines</p> | 3 | | 7 |

are provided with mechanism to control the movements of turret so that tools can be fed into work at desired speed, withdrawn and indexed in the next position. Cam controlled mechanism is also provided for clamping the work in the collet, releasing it at the end of cycle and then feeding un-machined bar stock against the stop.



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IVa



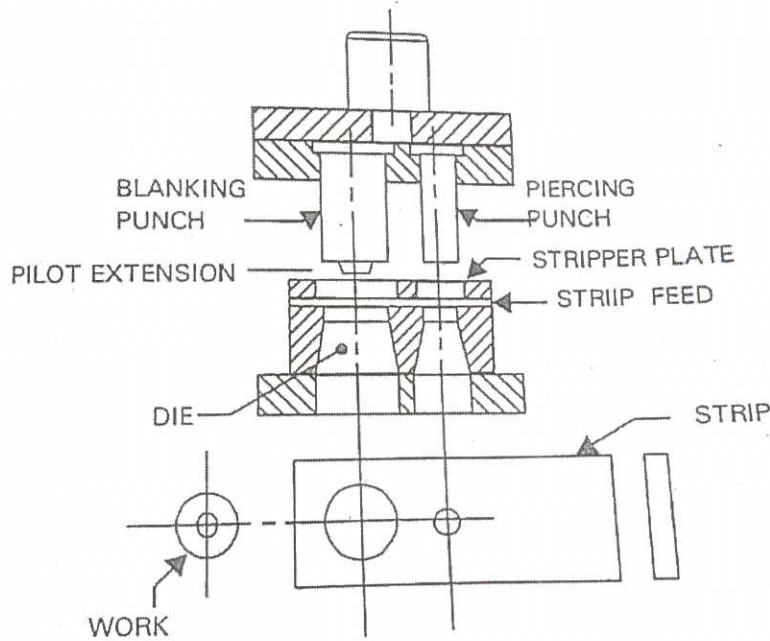
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The tracing stylus is held centrally in a universal ball joint and is free to move in any direction. The back end of the stylus is centred in a cup which is an integral part of the switch lever. Due to stylus movement, either contact c_1 or c_2 will be closed which energises the corresponding relay which in turn operates the corresponding magnetic clutch. Hence magnetic clutch moves the machine slide either left or right corresponding to stylus movement. A stylus movement of 0.025 mm is sufficient to close contact c_1 or c_2 and cause a change in the direction of the cutter travel.

4

of production. The scrap produced is high in progressive dies.



4

VI
a

JIG

FIXTURE

- 1- Hold the work piece in position and guide the cutting tool.
- 2- Usually movable on machine table
- 3- Used for drilling, reaming tapping and counter boring.
- 4- Lighter in construction.

- 1-Hold the work piece in position, but not guide the cutting tool.
- 2- Clamped in a fixed position on machine table
- 3- Used for milling, turning, grinding, welding etc
- 4- Heavy in construction.

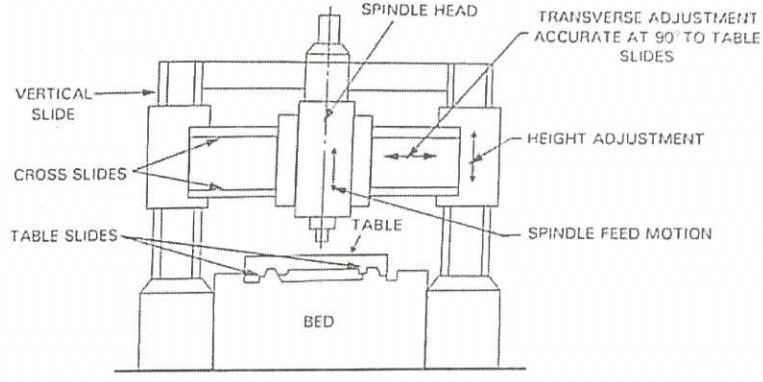
4x2

8

8

VI
b

in a planer type jig boring machine. It has a cross-rail, which is supported on two vertical columns. The cross rail carries a vertical spindle on its housing. The table is supported on the base of machine and it has reciprocating movement for adjustment of the work. The hole location is provided by the longitudinal movement of the table and 'traverse movement of the spindle along the cross-rail.



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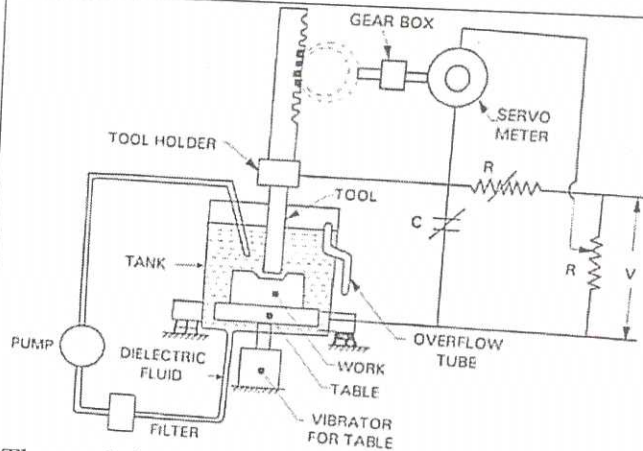
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UNIT-111

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|----------|---|-----|---|---|
| VII a | <p>1 Silicate bond, 2Vitrified bond, 3Shellac bond, 4Resinoid bond, 5Rubber bond, 6Oxychloride bond</p> <p>Vitrified bond : Vitrified bond is made of clay or feldspar. The clay and water is mixed with abrasive grains, and the mixture is moulded to form the wheel. It is then baked in a kiln upto a temperature of about 1250°C to develop structural strength.. As the burning proceeds clay fuses and forms porcelain that holds the grains together. The wheels are then cooled slowly to avoid thermal cracking, finished to size, inspected for dimensional accuracy and tested for defects. Since vitrified bond wheels are baked at high temperatures they can withstand high temperature generated during grinding process. The bond is used in about 75% of the wheels manufactured. Vitrified bond is denoted by 'V'</p> | 6x1 | 6 | 8 |
| VII b | <p>1-Tin coating 2-Parkerising 3-Galvanising</p> <p>Galvanising, the work surface must be cleaned by pickling and fluxed by immersing the material in a solution of zinc chloride. The flux prevents the oxidation of surface and assist the formation of good bond between the coating and base metal. After cleaning, the articles are dipped in a bath of molten zinc maintained at about 450°C. In galvanising the zinc coating results due to the tendency of the molten zinc to diffuse into the base metal. The time and temperature of dipping controls the character and thickness of coating layer. The usual coating thickness of galvanised sheets varies from 0.025 to 0.3 mm. At higher temperature diffusion rate is high; and long time in molten zinc increases the hardness and brittleness of coating layer and causes subsequent difficulty in bending and forming of the final product.</p> <p>Tin coating- Tin coating is generally applied for sheet steel by hot - dipping. Tin coated sheet, usually referred as tin plate, is used for food package containers. Tin coating on steel i.e., tin plate provides good corrosion resistance as long as coating is intact. 10.6For tin coating, the sheet steel is first cleaned and passed into bath of molten tin; maintained at a temperature of 315°C. A thin layer of coating about 0.0025mm is produced on sheet steel. Tin coating requires rigid quality control with critical surface inspection of the final coating. The tin coating is employed for cans for food, kitchen utensils, copper wires and tubes used in refrigerator.</p> | 1 | 6 | 7 |
| | | 3 | | |
| | | 3 | | |

VIII

a



The work is placed in a tank, containing dielectric fluid, and the tool is mounted above the work piece. The constant gap between tool and workpiece is maintained by servo-system. The dielectric fluid is circulated through a pump at a pressure of 0.2 N/mm^2 or less. The work is connected to positive terminal to form anode and the tool is made cathode. The current is varied within a wide range from 0.5 to 400 amps, at 40-300 d.c volts. The circuit consists a capacitor in parallel with spark gap. At low voltage the dielectric acts as an insulator i.e spark gap behaves as an open circuit; as the voltage in the capacitor builds up, the fluid suffers dielectric breakdown and spark passes through the gap. The spark generates localised heat which melts and vaporise the metal to form crater on work surface. The form of the tool is reproduced in the work piece. The condenser discharges, the dielectric re-establishes the insulating film, the current flow drops to zero and the capacitor can be given charging again. The cycle is repeated at a frequency of 200-500000 Hz. Material removal is not confined to the work piece, the tool is also wear out. Discharge is always takes place at the closest gap, the electrode is fed continuously to cut the desired shape. Under optimum conditions wear ratio (ratio of volume of work material removed to volume of tool consumed) is 3:1 with metallic tools, and from 3:1 to 100:1 with graphite electrodes

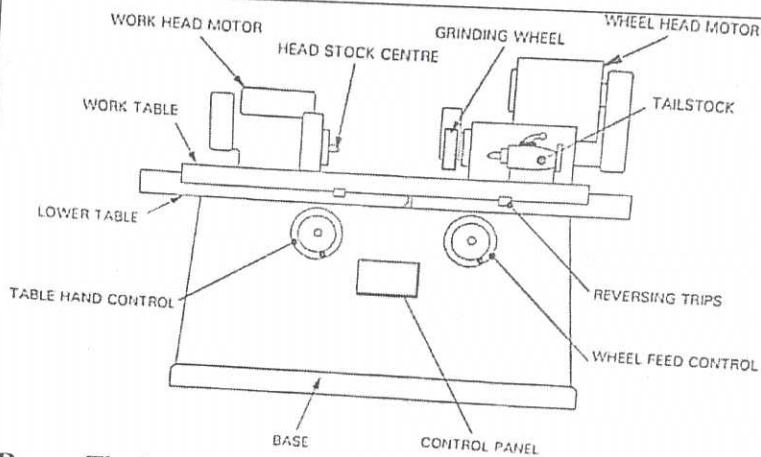
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VIII

b



Base : The base or bed rests on the floor. The top of the base is machined accurately to form ways for the table. It also houses the table drive mechanism.

It is made with cast iron to provide rigidity

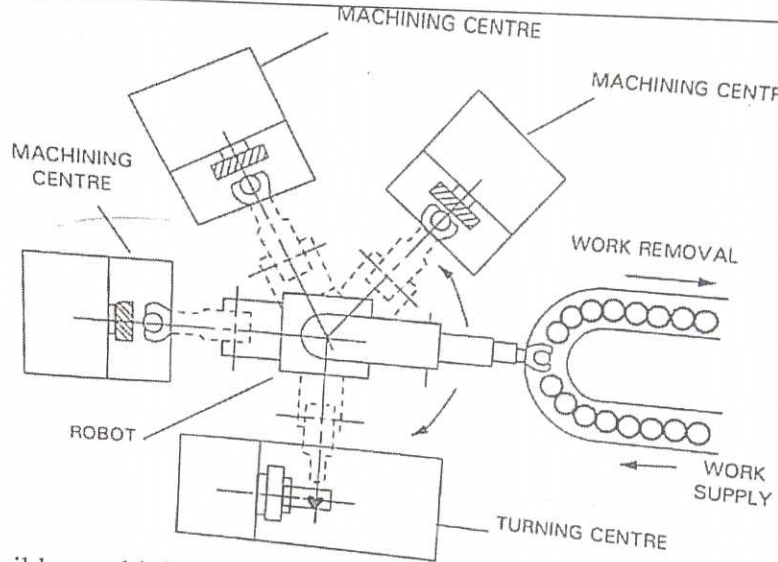
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| | <p>Tables : The lower table is mounted on the ways of the bed. It provides traverse motion to the work past the grinding wheel. It can be operated manually or automatically. The reversal of lower table (sliding table) is controlled by trip dogs Upper table (work table) is mounted on lower table and can be swivelled for grinding tapers and alignment purposes. The headstock and tailstock are mounted on this table.</p> <p>Headstock Headstock supports and drive the work piece with the help of centre and dog or chuck. It is mounted on the left end of the table and contains a motor for rotating the work.</p> <p>Tailstock : Tailstock or footstock is mounted on the right end of the table. It can be adjusted along the length of the bed to support the right end of the work.</p> <p>Wheelhead: Wheelhead is mounted on a cross-slide at right angles to the table, providing the in-feed movement of the wheel to the work. It has fixed speed motor to drive the grinding wheel. The grinding wheel is fed to the work by the engagement of cross-feed control lever.</p> | 3 | | |
|--|--|---|--|--|

UNIT-IV

| | | | | |
|---------|---|-----|---|---|
| IX a | <p>AUTOMATED GUIDED VEHICLE SYSTEM (AGVS):</p> <ol style="list-style-type: none"> 1-Automated guided vehicle systems offer a viable solution when the conventional systems are inadequate to satisfy the requirements of plants. 2-They are employed where the product is carried out through interconnected work cells and where flexibility and rapid change-over times are of primary importance. 3-AGVS possess intrinsic flexibility and capability to integrate with other automatic devices such as robots, CNC, automatic storage system. 4-These system find application for distribution, assembly and manufacturing. 5-Automated guided vehicles (AGVs) are modern material-handling and conveying systems that are more appropriate for FMS applications and automation. 6-An AGV is a computer controlled, driverless vehicle used for transporting materials from point-to-point in a manufacturing setting. 7-AGVs are powered by means of on-board batteries that allow operation for several hours between recharging. 8-For moving pallet loads in factory or warehouse. 9-For moving work-in-process along variable routes in low and medium production 10-Just-in-time deliveries. 11- Reduced labour and operational costs. 12-Reduced product damage. 13- Higher operational efficiency and reliability (efficient transport management, no errors). 14- Increased safety. | 8x1 | 8 | 8 |
|---------|---|-----|---|---|

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|---------|--|---|--|---|
| IX b | <p>1-Linear joint (L-joint) : Permits linear sliding motion between two links whose arms are parallel</p> <p>2- Orthogonal joint (O-joint) : Permits linear sliding motion between two links which are perpendicular to each other.</p> <p>3-Rotational joint (R-joint): Provides rotational relative motion of the joint, the axes of rotation being parallel to the axes of the two links.</p> <p>4-Twisting joint (T-joint) : Permits rotary motion between two links, the axis with the axis of rotation being parallel to the axes of the two links</p> <p>5- Revolving joint (V-joint) : Provides rotary motion; the axis of the input link is parallel to the axis of rotation, and the axis of out put link is perpendicular to the axis of rotation.</p> | 7 | | 7 |
| Xa |  <p>The flexible machining cell (FMC) has more than one machine tool with some form of pallet changing equipment, such as a robot or other specialised material handling device. The FMC generally has a fixed process, and parts flow sequentially between operations. The cell locks central computer control with real-time routing, load balancing, and production scheduling logic. The use of machining cells reduces the cycle time of the parts produced and subsequently minimises in-process inventory.</p> <p><u>Components</u></p> <ol style="list-style-type: none"> 1. Machine tools and related equipment : These include CNC and special purpose machine tools along with required tooling system 2. Material handling equipment : The functions of material handling system are to move the parts between the machines and to locate these parts for processing at the machines. The work pieces are mounted on the fixtures or pallets and moved through the system by automatically guided vehicle or conveyers <p>Computer control system : The functions of this system are to control machine tools, material handling system to monitor the performance of the</p> | 3 | | 7 |
| | | 4 | | |

| | | | | |
|----|--|---|--|---|
| | system and to schedule the production. | | | |
| Xb | Application of CAD and CAM 1-Programming for NC, CNC and industrial robots. 2- Design of dies and moulds for casting, and complex dies for sheet meta operations. 3-Design of tool and fixtures. 4- Quality control and process planning. 5-Inspection and scheduling, 6-Plant layout Main Applications of Computer Aided Design (CAD) Solid Modelling Surface Modelling Assembly Drafting Detailing Reverse Engineering Main Applications of Computer Aided Manufacture (CAM) Plotter/cutters Laser cutting 3D Milling Turning 3D printing | 3 | | 7 |
| | | 2 | | |
| | | 2 | | |