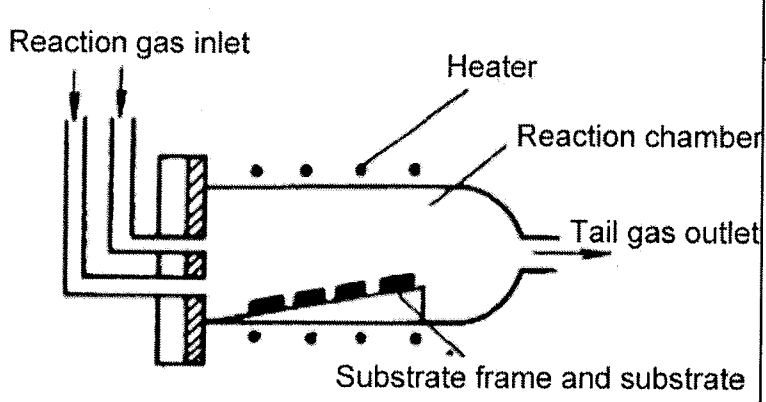
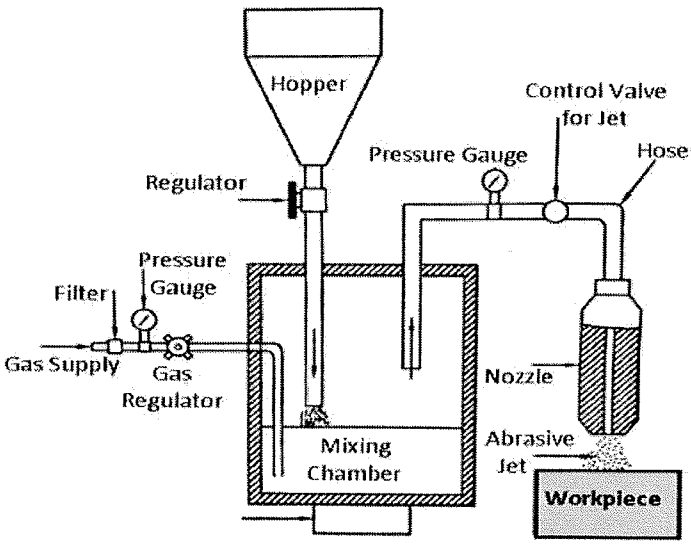
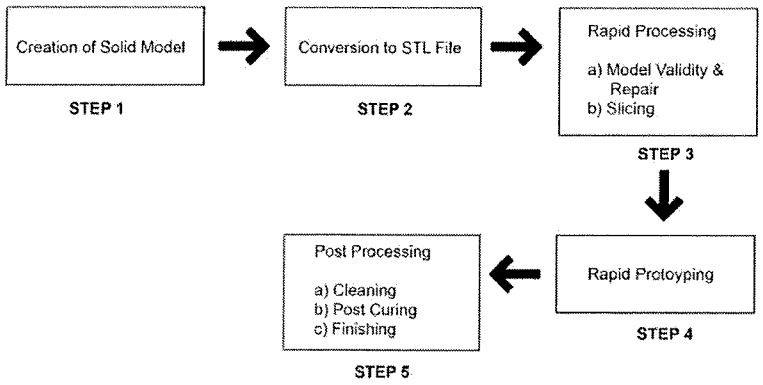
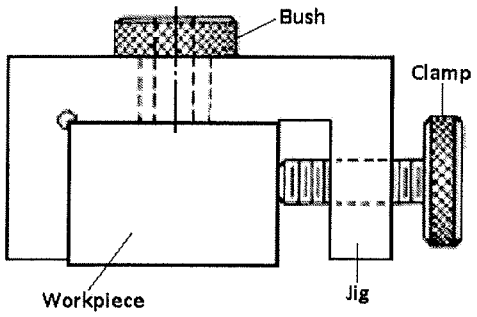
SCHEME OF VALUATION						
		2109230037				
REVISION 2021					Course Code:5023A	
Course Title: **MODERN PRODUCTION PROCESS**						
Qs. No:	**Scoring Indicators**			**Split Score**	**Sub Total**	**Total**
I	**PART-A**					
1	Plate jig				1	1
2	Powder metallurgy				1	1
3	Sputtering				1	1
4	Light Amplification by Stimulated Emission of Radiation				1	1
5	Mechanical erosion				1	1
6	Machine control unit				1	1
7	G28				1	1
8	Computer Integrated manufacturing (CIM)				1	1
9	Work envelope				1	1
II	**PART-B**					
1	1	A jig controls and guide the machine tool	Fixture holds and supports the component precisely for machining operations.	Any 3 points (3x1)	3	3
	2	Jig ensures accuracy, repeatability and interchangeability.	The fixture provides a reduction in error by holding a component firmly on a table.			
	3	Jigs are usually on the lighter side	The fixture is bulky, rigid and heavy.			
	4	Jig can be put in place and held by hand pressure.	Fixtures are always placed firmly on a machine table.			
	5	Some of the standard jig functions are drilling, reaming, tapping and boring.	Fixtures are used explicitly in milling machines, slotting machines and shapers.			
	6	Jigs cost more.	Fixtures are not that cost-savvy compared to jigs.			
	7	Jigs require intricate design operations	Fixture design operations are relatively less complicate.			

2	Chemical vapor deposition is a coating method that is commonly used to produce thin films and coatings of very high quality. Gaseous reactants are usually used in this process. In chemical vapor deposition, you transport one or more volatile precursors to the reaction chamber. The volatile precursors usually decompose on a heated substrate surface in the reaction chamber. This process creates some chemical by-products which are emitted from the reaction chamber alongside the unreacted volatile precursors. A lot of materials are deposited via the chemical vapor deposition method, including silicides, metal oxides, sulfides, and arsenides.	Any 2 points (2x1)	2	3
		Fig: 1 mark	1	
3	**Advantages of Metal Spraying** 1. Increased durability. 2. Modified electrical properties. 3. Increased or decreased corrosion protection. 4. Increased hardness. 5. Increased or decreased friction. 6. Increased wear resistance. 7. Additional protection to damaged material	Any 3 points (3x1)	3	3
4	1. It should have high electrical conductivity. 2. It should have toxicity. 3. It should have low corrossivity. 4. It should have good chemical stability 5. It should have good electrochemical stability. 6. It should have controllable and low passivating effect 7. It should have good machining ability.	Any 3 points (3x1)	3	3

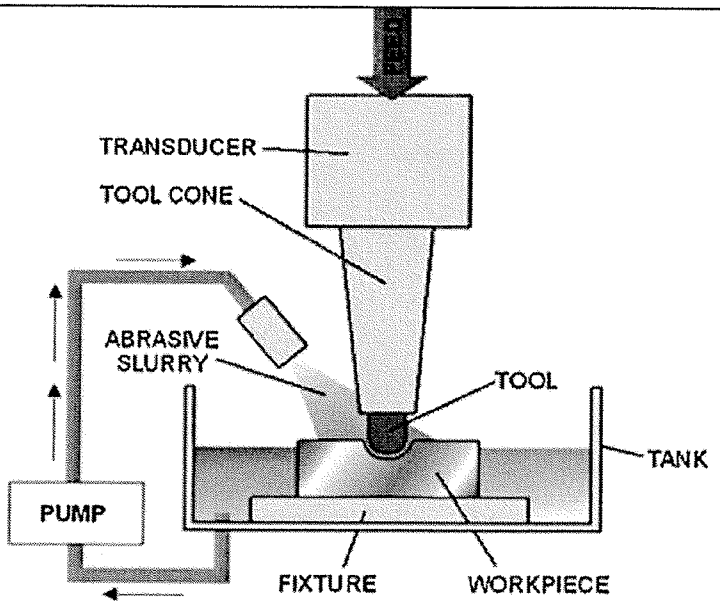
5	The fundamental principle of Abrasive jet machining involves the use of a high-speed stream of abrasive particles carried by a high-pressure gas or air on the work surface through a nozzle. The metal is removed due to erosion caused by the abrasive particles impacting the work surface at high speed. With repeated impacts, small bits of material get loosened and a fresh surface is exposed to the jet. **Working:** Through hopper, fine grained abrasive powder is filled in a mixing chamber. The gas as air is supplies through the pipeline which carries a pressure gauge and regulator to control the flow. The gas or air is supplied under pressure into the chamber; the pressure of gas varies from 2 to 3 kg/cm^2. This mixture of high pressure gas and compressed air is passed through a nozzle on the surface of work piece and due to high speed mixture erosion is caused and metal removal takes place.  **Principle of Abrasive Jet Machining**	Any 2 points (2x1) Fig. 1 mark	2 1	3

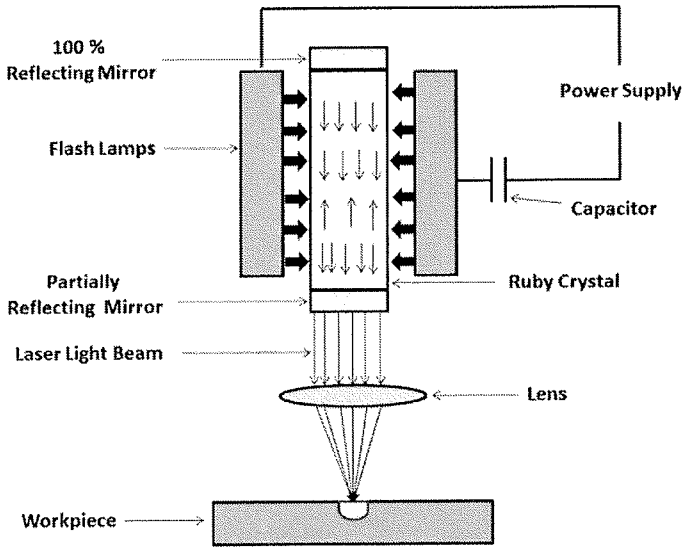
6	**Advantages of USM** 1. It can be used to drill holes on very hard materials like stones, carbides, ceramics and other brittle materials. 2. Non-conducting materials like glass, ceramics and semi precious stones can also be machined. 3. It can be used to drill curved holes in brittle material. 4. Produces less heat.	Any 3 points (3x1)	3	3
7	Rapid prototyping quickly creates a physical part directly from its CAD model data using various manufacturing techniques. It can use at any stage of the product development cycle for any components or sub-components. It helps to create a prototype quickly to visually and functionally evaluate a part or part or some part features. **Steps:**  	Any 1 points (1x1) Fig. 2 mark	3	3
8	• Computer Aided Process Planning is a process that is done by using the computer. • CAPP help to produce a design that needed for manufacturing like instruction, specifications etc. • This used to give complete information to manufacture a product. • To perform this operation it should be well coordinate with CAD/CAM. • This is an important technique used in the manufacturing industry. • This is widely used due to the quick response and more flexibility in manufacturing firms. • This used to set standard timings in operation and helps in improving process planning.	Any 3 points (3x1)	3	3

9	**Benefits of GT** a. Reduced material handling. b. Reduced tool set-up time. c. Reduced work- in- process. d. Promotes standardization of tooling, fixture and setups. e. Simplified process planning and production scheduling. f. Better work satisfaction. Better product quality and productivity.	Any 3 points (3x1)	3	3
10	Assembly Bonding/Sealing Cleaning Coating Cutting De burring Drilling Fiber glass cutting Foundry Grinding Material removal Meat processing Milling Painting Polishing Routing	Any 6 points (6x1/2)	3	3
	PART-C			
III	**Types of Jigs** Following are the seven different types of jigs. 1. Template jig 2. Plate jig 3. channel jig 4. Diameter jig 5. Leaf jig 6. Ring jig 7. Box jig	Any 6 points (6x1/2)	3	7

	 **CHANNEL JIG** The channel jig is illustrated in the fig. It is a simple type of jig having a channel-like cross-section. The component is fitted within the channel and is located and clamped by rotating the knurled knob. The tool is guided through the drill bush.	Fig. 2 Marks 2 points 2 Marks	2 2	
	OR			
IV.	**Powder Metallurgy Process Steps** To convert a powder into a final product, it requires number of steps or process. So, the powder metallurgy consists four fundamental processes, they are 1. Powder Preparation: Melt Atomization is one of the procedures used to create the powder. In this process, the liquid metal is broken down into small droplets, which cools and solidify into minute particles. 2. Powder Mixing and blending: Powder Particles are mixed with additional powders, binders, and lubricants during the mixing and blending process to ensure the finished item has the required properties. 3. Compacting: It involves squeezing and compressing the dry powder into a specified shape or mold. When it is done correctly, compacting decreases possible voids and considerably boosts product density. 4. Sintering: Is a heat treatment process that involves in the powder metallurgy process in which a large number of compressed pieces are exposed to temperatures high enough to generate enough pressure to enable the loose particles to join and link, producing a solid piece.	4 steps		7

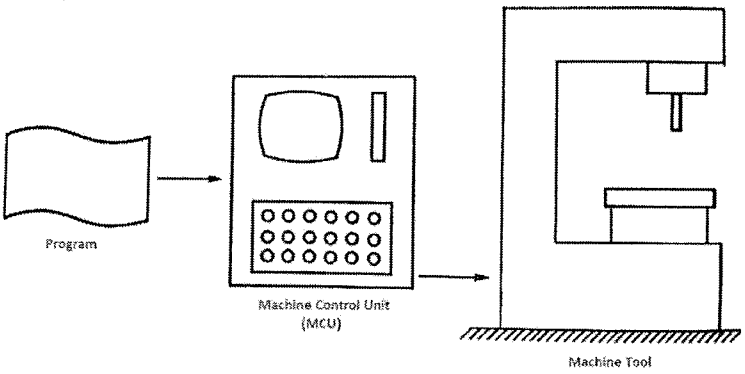
V	**Mechanical :** • Abrasive Jet Machining (AJM) • Ultrasonic Machining (USM) **Chemical :** • Chemical Machining (CHM) **Electro-Chemical :** • Electro-Chemical Machining (ECM) • Electro-Chemical Grinding (ECG) **Thermo-electric :** • Ion-Beam Machining (IBM) • Plasma Arc Machining (PAM) • Electrical Discharge Machining (EDM) • Electron-Beam Machining (EBM) • Laser-Beam Machining (LBM)	Any 7 points (7x1)	7	7
	OR			
VI	Ultrasonic machining is a process that removes material from the surface of a part through high frequency, low amplitude vibrations of a tool against the material surface in the presence of fine abrasive particles. The fine abrasive grains are mixed with water to form slurry that is distributed across the part and the tip of the tool. Energy of the vibration is transferred by tool tip to the abrasive particles, which in turn bombarded the work piece to be machined with an impact of grinding action. The cutting action occurs directly under the tool tip hence the impression produced will have the exact shape of tool tip.	Expla. 3 marks	3	7

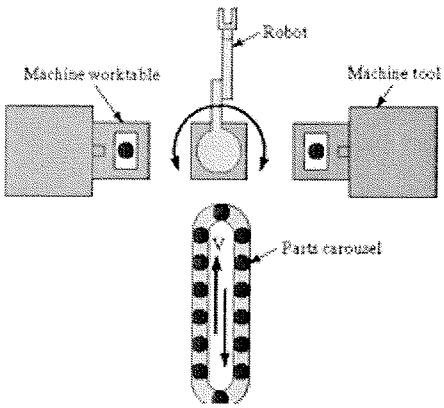
		Fig: 4 marks	4	
VII	Laser beam machining (LBM) is a non-conventional process in which material is removed using the laser beam to produce heat and due to that heat, metal is removed from the surface of the work piece, due to vaporization. The laser beam machining process is used for machining brittle materials with low conductivity, but it can be used on almost every material. **Working principle-** LBM machining works on the basis of laser properties in which a laser is directed towards the work piece for machining. This process uses thermal energy to remove materials from metallic or non-metallic surfaces. In this process, a monochromatic laser beam is made to focus on the work piece to be machined by a lens to give extremely high energy density to melt and vaporize any material.	Expla. 3 marks	3	7

		Fig: 4 marks	4	
	OR			
VIII	**Advantages of EDM** 1. Hard and brittle materials can be successfully machined. 2. Complicated contours can be produced. 3. High surface finish can be obtained. 4. Stresses are minimum. 5. High accuracy can be obtained. **Disadvantages** 1. Machining time is very long. 2. Tool wear is higher. 3. Power consumption is high.	Any 7 points (7x1)	7	7

IX	Three dimensional (3D) printing is an additive manufacturing process that creates a physical object from a digital design. The process works by laying down thin layers of material in the form of liquid or powdered plastic, metal or cement and then fusing the layers together. Some industries such as hearing aids manufacture and car manufactures use 3D printing to create prototypes and mass produce their products using custom scans. While it is currently too slow to be used in mass production, 3D printing technology is still evolving and has the potential to massively disrupt both manufacturing logistics and inventory management industries. However, the technology has been used to reduce the lead time in the development of prototypes of parts and devices, and the tooling needed to make them. This is hugely beneficial to small scale manufactures because it reduces their costs and time to market. 3D printing can create complex shapes using less material than subtractive manufacturing processes, such as drilling, welding, injection moulding and other processes. Making prototypes faster, easier and cheaper allows for more innovation, experimentation and product based start-ups.	Any 7 points (7x1)	7	7
	OR			
X.	M00-Program stops M01-Optional program stop M02-Program end M03-Spindle on clockwise M04-Spindle on counter clock wise M05-Spindle off M06-Tool change M08-Coolant on M09-Coolant off M10-Chuck or rotary table clamp	Any 7 points (7x1)	7	7

	M11-Chuck or rotary table clamp off M19-Orient spindle M30-program end, return to start. M97-Local sub-routine call M98-Sub-program call M99-End of sub program			
XI.	**Basic Components of NC machine** The basic components are: 1. Program of instructions 2. Machine control unit 3. Machine tool or processing equipment or other controlled processes **1. Program of Instructions** ▪ Part program is written based on the part geometry and cutting parameters. ▪ It is a set of detailed step by step command that direct the action of the processing equipment. ▪ Each command in a program refer position of cutting tool relative to work piece. ▪ NC system uses punched tapes for the input of program instructions. **2. Machine Controller Unit** ▪ It consists of some electronic hardware that reads the NC programme, interprets and translates it for mechanical actions. ▪ The part program is entered on the program tape in	Expla. 4 marks	4	7

	the form of punched holes. ▪ The holes are punched with the help of punching machine. ▪ The program tape is read by the tape reader. ▪ The controller takes input from the tape reader. **3. Machine Tool** ▪ **Executes the operations.** ▪ It consist of ▪ Worktable ▪ Cutting tools ▪ Jigs and fixtures ▪ Motors for driving spindle, coolant and lubricating system  Basic Components of NC Machines	Fig.3 marks	3	
	OR			
XII	G02-Circular interpolation clockwise G01- Linear interpolation G05-Hold /Delay G03-Circular interpolations counter clockwise G90-Absolute dimensioning G91-Incremental dimensioning G33-thread cutting G94-Feed rate in mm/min		7	7

XIII	Flexible manufacturing cell consists of one or several CNC machines or machining centers. The unit can change tools and fixtures as needed to machine different work pieces. It is suitable for processing parts with complex shapes, requiring simple processing steps, long processing time and small batch size. It has greater equipment flexibility but lower flexibility for personnel and processing. FMC's are actually an extension of the CNC machining center. They are generally composed of a machining center, individual robots and automatic guided vehicles, which are controlled by the back end computer.  		7	7
	OR			
XIV	1. Linear joint: (L-joint): Permits linear sliding motion between two links whose arms are parallel. 2. Orthogonal joint (O-joint): Permits linear sliding motion between two links which are perpendicular to each other. 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. 4. Twisting joint (T-joint) - Permit rotary motion between two links, the axis with the axis of rotation being parallel to the axes of the two links. 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 output link is perpendicular to the axis of rotation.		7	7