JEPPIAAR ENGINEERING COLLEGE

Jeppiaar Nagar, Rajiv Gandhi Salai – 600 119

DEPARTMENT OF

MECHANICAL ENGINEERING

QUESTION BANK

IV SEMESTER

ME6402 – MANUFACTURING TECHNOLOGY - II

Regulation – 2013

JEPPIAAR ENGINEERING COLLEGE

Vision of Institution

To build Jeppiaar Engineering College as an institution of academic excellence in technological and management education to become a world class university.

Mission of Institution

- To excel in teaching and learning, research and innovation by promoting the principles of scientific analysis and creative thinking.
- To participate in the production, development and dissemination of knowledge and interact with national and international communities.
- To equip students with values, ethics and life skills needed to enrich their lives and enable them to meaningfully contribute to the progress of society.
- To prepare students for higher studies and lifelong learning, enrich them with the practical and entrepreneurial skills necessary to excel as future professionals and contribute to Nation's economy.

PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

JEPPIAAR ENGINEERING COLLEGE

DEPARTMENT OF MECHANICAL ENGINEERING

VisionoftheDepartment

To create excellent professionals in the field of Mechanical Engineering and to uplift the quality of technical education on par with the International Standards.

Department Mission

1. **To reinforce** the fundamentals of Science and Mathematics to Mechanical Engineering **and critically and relatively investigate co**mplex mechanical systems and processes.
2. To engage in the **production, expansion and practice** of advanced engineering applications through knowledge sharing activities by interacting with global communities and industries.
3. To**equip** students with **engineering ethics, professional roles, corporate social responsibility** and life skills and**apply**them for the betterment of society.
4. **To promote** higher studies and lifelong learning and entrepreneurial skills and **develop**excellent professionals for empowering nation's economy.

PEO's

1. To **enrich** the technical knowledge of design, manufacturing and management of mechanical systems and **develop creative and analytical thinking** in research.
2. To **relate, strengthen and develop** the theoretical knowledge of the Mechanical Engineering by exhibiting various concepts applied through diverse industrial exposures and experts' guidance.
3. **Facilitate** the students to communicate effectively on complex social, professional and engineering activities with strict adherence to ethical principles.
4. **Create awareness for independent and life long learning and develop the ability to keep abreast of modern trends and adopt them for personal technological growth of the nation.**

PSO's

1. To understand the basic concept of various mechanical engineering field such as design, manufacturing, thermal and industrial engineering.
2. To apply the knowledge in advanced mechanical system and processes by using design and analysis techniques.
3. To develop student's professional skills to meet the industry requirements and entrepreneurial skills for improving nation's economy stronger.

COURSE OUTCOME

C212.1	Illustrate the concept and basic mechanics of metal cutting process during machining
C212.2	Demonstrate the knowledge on various machining process in automatic and semi-automatic lathe.
C212.3	Develop the knowledge of working principles and operations of special machines like shaper, milling, gear cutting machines.
C212.4	Illustrate the grinding process through different types of grinding machines.
C212.5	Illustrate the basic concept of computer Numerical Control and its programming.

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DEPARTMENT OF MECHANICAL ENGINEERING

QUESTION BANK

SUBJECT : ME6402 – MANUFACTURING TECHNOLOGY - II

YEAR /SEM: II /IV

UNIT I THEORY OF METAL CUTTING

Mechanics of chip formation, single point cutting tool, forces in machining, Types of chip, cutting tools – nomenclature, orthogonal metal cutting, thermal aspects, cutting tool materials, tool wear, tool life, surface finish, cutting fluids and Machinability.

PART – A

CO Mapping : C212.1

Q.No	Questions	BT Level	Competence	PO
1	**Classify the process of metal shaping?**	BTL-2	Understanding	PO1
2	**Explain the non-cutting shaping process?**	BTL-2	Understanding	PO1
3	**Classify the relative motion between the work piece and cutting tool.**	BTL-2	Understanding	PO1,PO2
4	**What are the different types of cutting tool?**	BTL-2	Understanding	PO1,PO2
5	**Mention the various angles in cutting tool.**	BTL-2	Understanding	PO1,PO2,PO3
6	**What is tool signature?**	BTL-1	Remembering	PO1,PO2,PO3
7	**What is the effect of back rake angle and mention its types?**	BTL-1	Remembering	PO1,PO2,PO3
8	**Explain the nose radius.**	BTL-2	Understanding	PO1,PO3
9	**What are the conditions for using positive rake angle?**	BTL-1	Remembering	PO1,PO4
10	**When will the negative rake angles be used?**	BTL-1	Remembering	PO1,PO3
11	**Define orthogonal and oblique cutting.**	BTL-1	Remembering	PO1,PO5
12	**What is shear plane?**	BTL-1	Remembering	PO2,PO3
13	**What is cutting force?**	BTL-1	Remembering	PO2,PO3
14	**What is a chip and mention its different types?**	BTL-1	Remembering	PO3,PO5
15	**What is chip thickness ratio?**	BTL-1	Remembering	PO3,PO4
16	**What is chip reduction coefficient?**	BTL-1	Remembering	PO1,PO3
17	**Classify the different types of chip breakers.**	BTL-2	Understanding	PO2,PO3
18	**What are the cuttings forces acting on the cutting tool?**	BTL-1	Remembering	PO1,PO3
19	**What are the assumptions made in lee and Shaffer's theory?**	BTL-1	Remembering	PO2,PO5
20	**What are the factors affecting the machinability?**	BTL-1	Remembering	PO1,PO4
21	**How the machinability can be evaluated?**	BTL-1	Remembering	PO1,PO3
22	**What is machinability index?**	BTL-1	Remembering	PO2,PO4
23	**Give two examples for orthogonal cutting.**	BTL-3	Applying	PO2,PO3
24	**What is meant by built up edge?**	BTL-1	Remembering	PO5,PO9
25	**What are the favorable factors for continuous chip with**	BTL-1	Remembering	PO1,PO3

	built up edge?			
26	**How do you classify tool wear?**	**BTL-1**	**Remembering**	**PO1,PO3**
27	**Name any two reasons for flank wear in cutting tools.**	**BTL-6**	**Creating**	**PO1,PO3**
28	**Define Tool life.**	**BTL-1**	**Remembering**	**PO1,PO3**
29	**Write Taylor's tool life equation.**	**BTL-1**	**Remembering**	**PO1,PO4**
30	**Why is lubrication not required while machining cast iron?**	**BTL-1**	**Remembering**	**PO1,PO5**
	PART – B & C			
1	**How is metal removed in metal cutting? Explain the process with neat sketch.**	**BTL-1**	**Remembering**	**PO1,PO2, PO3**
2	**Explain the properties of cutting tool materials, essential requirements and classification of tool materials.**	**BTL-2**	**Understanding**	**PO1,PO2, PO3**
3	**Explain Merchant circle diagram and derive the relation.**	**BTL-2**	**Understanding**	**PO1,PO2, PO3**
4	**How chips are classified in metal cutting? What are the conditions for the formation of different types of chips?**	**BTL-1**	**Remembering**	**PO1,PO2, PO3**
5	**Define tool wear and explain the reasons of tool – failure.**	**BTL-1**	**Remembering**	**PO1,PO2, PO4**
6	**Write a short note on cutting fluids in metal cutting.**	**BTL-1**	**Remembering**	**PO1,PO2, PO5**
7	**The Taylorian tool-life equation for machining C-40 steel with a 18:4:1 HSS cutting tool at a feed of 0.2 mm/min and a depth of cut of 2mm is given by $VT^n = C$, where n and C are constants. The following V and T observations have been noted.** **V_1 m/min 25 35** **T_1 min 90 20** **Calculate:** **i. n and C** **ii. Hence recommend the cutting speed for a desired tool life of 60 minutes.**	**BTL-5**	**Evaluating**	**PO1,PO2, PO5**
8	**A specimen of 100mm length along the stroke of shaper is machined with a tool with 15° rake angle. The uncut chip thickness is 1.5mm. If a chip length of40mm is obtained during one stroke of machining, find the shear plane angle and thickness of cut-chip.**	**BTL-5**	**Evaluating**	**PO1,PO2, PO9**

UNIT- II TURNING MACHINES				
Centre lathe, constructional features, specification, operations – taper turning methods, thread cutting methods, special attachments, machining time and power estimation. Capstan and turret lathes- tool layout – automatic lathes: semi automatic – single spindle : Swiss type, automatic screw type – multi spindle.				
PART – A				
CO Mapping : C212.2				
Q.No	**Questions**	**BT Level**	**Competence**	**PO**
1	**What is a lathe?**	**BTL-1**	**Remembering**	**PO1,PO2**
2	**What are the various operations that can be performed on a lathe?**	**BTL-1**	**Remembering**	**PO1,PO3**
3	**What are the principles parts of a lathe?**	**BTL-1**	**Remembering**	**PO1,PO2**
4	**What is swing diameter?.**	**BTL-1**	**Remembering**	**PO1,PO3**
5	**Write the specifications of a typical lathe.**	**BTL-1**	**Remembering**	**PO1,PO4**
6	**Write down the names of any four lathe accessories.**	**BTL-1**	**Remembering**	**PO1,PO5**

7	**State the various parts mounted on the carriage.**	**BTL-2**	**Understanding**	**PO1,PO5**
8	**What are the functions of feed rod and lead screw?**	**BTL-1**	**Remembering**	**PO1,PO5**
9	**What is an apron?**	**BTL-1**	**Remembering**	**PO1,PO3**
10	**Mention different types of chucks used in a machine shop.**	**BTL-2**	**Understanding**	**PO1,PO2**
11	**What is the application of air operated chuck?**	**BTL-1**	**Remembering**	**PO1,PO2**
12	**What are the advantages of a collet chuck?**	**BTL-1**	**Remembering**	**PO1,PO4**
13	**What is the purpose of mandrel and its types?**	**BTL-1**	**Remembering**	**PO1,PO5**
14	**Calculate the time required for one complete cut on a piece of work having 250mm long and 40mm diameter. The cutting speed is 32 m/min and the feed is 0.4 mm/sec**	**BTL-5**	**Evaluating**	**PO1,PO2, PO3**
15	**Define tool room lathe.**	**BTL-1**	**Remembering**	**PO1,PO2**
16	**What are the advantages of semi-automatic lathe?**	**BTL-1**	**Remembering**	**PO1,PO5**
17	**Define automatic machine?**	**BTL-1**	**Remembering**	**PO1,PO5**
18	**What is the purpose of tumbler gear mechanism of a lathe?**	**BTL-1**	**Remembering**	**PO1,PO9**
19	**What is thread cutting operation?**	**BTL-1**	**Remembering**	**PO1,PO9**
20	**List the various thread cutting methods.**	**BTL-2**	**Understanding**	**PO1,PO5**
21	**What is a Centre guage that is used in threading?**	**BTL-1**	**Remembering**	**PO1,PO9**
22	**Mention any two limitations of a Centre lathe**	**BTL-2**	**Understanding**	**PO1,PO5**
23	**Compare the advantages of turret lathe over capstan lathe.**	**BTL-2**	**Understanding**	**PO2,PO3**
24	**What is the difference between a ram-type turret lathe and saddle type turret lathe?**	**BTL-1**	**Remembering**	**PO2,PO3**
25	**State the different methods of turning taper.**	**BTL-4**	**Analyzing**	**PO2,PO3**
26	**What are programmed automatic lathes?**	**BTL-1**	**Remembering**	**PO2,PO5**
27	**State the advantages of swiss type screw cutting machine**	**BTL-1**	**Remembering**	**PO2,PO5**
28	**What are the advantages of single spindle automatic lathe?**	**BTL-1**	**Remembering**	**PO3,PO5**
29	**What is Swiss type automat?**	**BTL-1**	**Remembering**	**PO4,PO5**
30	**What is bar stop?**	**BTL-1**	**Remembering**	**PO3,PO5**

PART – B & C

1	**Describe the work holding devices and mechanisms in a lathe**	**BTL-2**	**Understanding**	**PO1,PO2,PO5**
2	**Explain the specification of a lathe and various attachments used on a centre lathe**	**BTL-2**	**Understanding**	**PO1,PO2,PO9**
3	**Explain with neat sketches the working principle of taper turning operation with different methods?**	**BTL-2**	**Understanding**	**PO1,PO2,PO9**
4	**Explain parallel action and progressive action multi spindle automatics.**	**BTL-2**	**Understanding**	**PO1,PO2,PO3**
5	**Explain the working principle of turret lathe and Geneva mechanism of turret lathe.**	**BTL-2**	**Understanding**	**PO1,PO2,PO4**
6	**Describe the working principle of Automatic cutting off machine and Swiss type automatic lathes**	**BTL-2**	**Understanding**	**PO1,PO2,PO3**

UNIT III SHAPER, MILLING AND GEAR CUTTING MACHINES

Shaper - Types of operations. Drilling ,reaming, boring, Tapping. Milling operations-types of milling cutter. Gear cutting – forming and generation principle and construction of gear milling ,hobbing and gear shaping processes –finishing of gears.

PART – A

CO Mapping : C212.3

Q.No	Questions	BT Level	Competence	PO
1	**What are the specifications of milling machines?**	**BTL-1**	**Remembering**	**PO1,PO2**
2	**Mention the various movements of universal milling machines.**	**BTL-2**	**Understanding**	**PO1,PO3**
3	**What are the different ways for machining work pieces in Plano milling?**	**BTL-1**	**Remembering**	**PO1,PO3,PO4**
4	**List the various types of milling attachments.**	**BTL-1**	**Remembering**	**PO1,PO2,PO4**

5	**Write nomenclature of plain milling cutter.**	**BTL-1**	**Remembering**	**PO1,PO2,PO5**
6	**Differentiate up milling and down milling.**	**BTL-4**	**Analyzing**	**PO1,PO4,PO5**
7	**How do you specify radial drilling machine.**	**BTL-1**	**Remembering**	**PO1,PO2,PO9**
8	**Write down any four operations that can be performed in a drilling machine.**	**BTL-1**	**Remembering**	**PO1,PO9**
9	**What is meant sensitive hand feed?**	**BTL-1**	**Remembering**	**PO1,PO4,PO9**
10	**What are the applications of boring?**	**BTL-1**	**Remembering**	**PO1,PO2,PO9**
11	**Mention any four shaper specification.**	**BTL-1**	**Remembering**	**PO1,PO4**
12	**Write down any four operations that can be performed in a shaping machine.**	**BTL-1**	**Remembering**	**PO2,PO5**
13	**What are the various forming methods for manufacturing gears?**	**BTL-1**	**Remembering**	**PO1,PO3**
14	**List the gear generating process.**	**BTL-1**	**Remembering**	**PO3,PO5**
15	**Give the functions of flutes on taps.**	**BTL-1**	**Remembering**	**PO3,PO4**
16	**What is deep hole drilling?**	**BTL-1**	**Remembering**	**PO2,PO3**
17	**State the nomenclature of a standard drill.**	**BTL-1**	**Remembering**	**PO1,PO4**
18	**Define reaming.**	**BTL-1**	**Remembering**	**PO1,PO5**
19	**What are the work holding devices used in milling machines?**	**BTL-1**	**Remembering**	**PO1,PO5**
20	**What are the work holding devices used in milling machines?**	**BTL-1**	**Remembering**	**PO1,PO5**
21	**What is gear hobbing process?**	**BTL-1**	**Remembering**	**PO1,PO5**
22	**Mention any two advantages of gear hobbing.**	**BTL-1**	**Remembering**	**PO1,PO4**
23	**What are the limitations of gear hobbing?**	**BTL-1**	**Remembering**	**PO2,PO3**
24	**What is meant by plain or slab milling?**	**BTL-1**	**Remembering**	**PO9**
25	**What is climb milling?**	**BTL-1**	**Remembering**	**PO1,PO9**
26	**What are the two types of arbor?**	**BTL-1**	**Remembering**	**PO1,PO9**
27	**Define boring.**	**BTL-1**	**Remembering**	**PO1,PO2**
28	**Define the metal removal rate.**	**BTL-1**	**Remembering**	**PO1,PO2**
29	**List any two types of quick return mechanism.**	**BTL-1**	**Remembering**	**PO1,PO3**
30	**What is gang drilling machine?**	**BTL-1**	**Remembering**	**PO1,PO2**
PART – B & C				
1	**Explain the principle of operation of a shaper machine with a neat sketch.**	**BTL-2**	**Understanding**	**PO1,PO2**
2	**Describe with neat sketch the drive mechanisms used in shaper.**	**BTL-2**	**Understanding**	**PO1,PO3**
3	**Sketch and explain the working principle of upright and radial drilling machine and twist drill**	**BTL-2**	**Understanding**	**PO1,PO4,PO9**

4	**Sketch the following operations performed in drilling machine. i. Drilling ii. Reaming iii. Boring iv. Counter boring v. Counter sinking vi. Spot facing vii. Tapping viii. Trepanning**	**BTL-2**	**Understanding**	**PO1,PO5,PO9**
5	**Explain the working of Jig boring and Vertical boring machine with neat sketch.**	**BTL-2**	**Understanding**	**PO1,PO2**
6	**Explain the horizontal knee type milling machine and types of milling cutters with neat sketch.**	**BTL-2**	**Understanding**	**PO1,PO3**
7	**Explain the principle of operation of gear hobbing, gear shaving, gear shaping, gear finishing and gear forming.**	**BTL-2**	**Understanding**	**PO1,PO4**

UNIT IV ABRASIVE PROCESS AND BROACHING

Abrasive processes: grinding wheel – specifications and selection, types of grinding process– cylindrical grinding, surface grinding, centreless grinding and internal grinding- Typical applications – concepts of surface integrity, broaching machines: broach construction – push, pull, surface and continuous broaching machines

PART – A

CO Mapping : C212.4

Q.No	Questions	BT Level	Competence	PO
1	**What is the process of self-sharpening of the grinding wheel?**	**BTL-1**	**Remembering**	**PO1,PO2,PO7**
2	**Define grinding.**	**BTL-1**	**Remembering**	**PO2,PO6,PO 7**
3	**What is meant by centreless grinding?**	**BTL-1**	**Remembering**	**PO1,PO7,PO8**
4	**What are the types of surfaces that could be produced using plain cylindrical grinders?**	**BTL-1**	**Remembering**	**PO1,PO7,PO8**
5	**State any four advantages and disadvantages of centreless grinding.**	**BTL-1**	**Remembering**	**PO3,PO7**
6	**What are the types of surface grinders?**	**BTL-1**	**Remembering**	**PO3,PO8**
7	**What is a tool post grinder?**	**BTL-1**	**Remembering**	**PO6,PO8**
8	**Give examples to natural abrasives and artificial abrasives.**	**BTL-1**	**Remembering**	**PO1,PO7, PO8**
9	**Define the following terms used in grinding wheel:**	**BTL-1**	**Remembering**	**PO1,PO3,PO6**
10	**What is meant by "grade" and "structure" of a grinding wheel?**	**BTL-1**	**Remembering**	**PO1,PO7, PO8**
11	**Mention the types of grinding operation performed on a cylindrical grinding.**	**BTL-1**	**Remembering**	**PO1,PO2,PO3**
12	**What are the specifications of a grinding wheel?**	**BTL-1**	**Remembering**	**PO1,PO7,PO8**
13	**State the various methods of centreless grinding.**	**BTL-1**	**Remembering**	**PO1**
14	**What are grinding points?**	**BTL-1**	**Remembering**	**PO1,PO6**
15	**What is the use of swing frame grinder?**	**BTL-1**	**Remembering**	**PO1,PO6**
16	**Name the two types of bond.**	**BTL-1**	**Remembering**	**PO1,PO7,PO9**

17	**What is meant by dressing and truing?**	**BTL-1**	**Remembering**	**PO1,PO6,PO8**
18	**What is the process of lapping?**	**BTL-1**	**Remembering**	**PO2,PO3**
19	**What is meant by honing?**	**BTL-1**	**Remembering**	**PO2,PO5**
20	**Indicate any two specification of broaching machine.**	**BTL-1**	**Remembering**	**PO2,PO5**
21	**How will you classify the broaching machine?**	**BTL-1**	**Remembering**	**PO3,PO9**
22	**What are the advantages and limitations of broaching?**	**BTL-1**	**Remembering**	**PO1,PO2**
23	**What is the main difference between pull down and pull up type vertical broaching machine?**	**BTL-1**	**Remembering**	**PO1,PO3**
24	**List all the Nomenclature of a broaching tool.**	**BTL-1**	**Remembering**	**PO1,PO6**
25	**What are the various types of continuous broaching machines?**	**BTL-1**	**Remembering**	**PO1,PO7**
26	**What is broaching?**	**BTL-1**	**Remembering**	**PO1,PO8**
27	**List four applications of broaching machines.**	**BTL-1**	**Remembering**	**PO1,PO8**
28	**List some of the materials of broaching tools.**	**BTL-1**	**Remembering**	**PO1,PO9**
29	**What are the different operations that can be performed on a broaching machine?**	**BTL-1**	**Remembering**	**PO2,PO3**
30	**Classify vertical broaching machines.**	**BTL-2**	**Understanding**	**PO5,PO7**
	PART – B & C			
1	**Discuss the various bonding materials and abrasives used for making grinding wheels.**	**BTL-6**	**Creating**	**PO1,PO2,PO3**
2	**Explain the working principle of cylindrical, surface and centreless grinding process.**	**BTL-2**	**Understanding**	**PO1,PO3,PO5**
3	**Classify the grinding machines, factors considered to select grinding wheels also explain about truing and dressing.**	**BTL-2**	**Understanding**	**PO2,PO5,PO 7**
4	**Write briefly about broaching machines and its operations with neat sketches.**	**BTL-1**	**Remembering**	**PO3,PO6,PO 8**
5	**Discuss push and pull type broaching machines with neat sketches.**	**BTL-6**	**Creating**	**PO1,PO6,PO7**
6	**Explain the working principles of continuous broaching machine and also state the advantages and limitations of broaching.**	**BTL-2**	**Understanding**	**PO1,PO8,PO9**

	UNIT – V CNC MACHINING			
Numerical Control (NC) machine tools – CNC types, constructional details, special features, machining centre, part programming fundamentals CNC – manual part programming – micromachining – wafer machining				
	PART – A			
CO Mapping : C212.5				
Q.No	**Questions**	**BT Level**	**Competence**	**PO**

1	**State the advantages of NC machines?**	**BTL-1**	**Remembering**	**PO1,PO5,PO 6, PO7,PO8**
2	**What is meant by numeric control?**	**BTL-1**	**Remembering**	**PO1,PO2,PO 5,PO6, PO7**
3	**List the various types of NC machines?**	**BTL-1**	**Remembering**	**PO1,PO2,PO 5,PO6, PO7**
4	**List the various components of DNC?**	**BTL-1**	**Remembering**	**PO1,PO2,PO 5,PO6, PO7**
5	**State the advantages of CNC machines?**	**BTL-1**	**Remembering**	**PO1,PO5,PO 6, PO7,PO8**
6	**What is meant by 'tool magazine' in a CNC machine?**	**BTL-1**	**Remembering**	**PO1,PO3,PO 5,PO6, PO7**
7	**Differentiate between CNC and DNC.**	**BTL-4**	**Analyzing**	**PO1,PO5,PO 6, PO7,PO8**
8	**Compare a closed loop NC system with open loop system**	**BTL-2**	**Understanding**	**PO1,PO4,PO 5,PO6, PO7**
9	**Classify the CNC machines.**	**BTL-2**	**Understanding**	**PO1,PO4,PO 5,PO6, PO7**
10	**List the methods of creating part programming.**	**BTL-1**	**Remembering**	**PO1,PO4,PO 5,PO6, PO7**
11	**What is meant APT program?**	**BTL-1**	**Remembering**	**PO1,PO4,PO 5,PO6, PO7**
12	**What are the canned cycles?**	**BTL-1**	**Remembering**	**PO1,PO5,PO 6, PO7,PO8**
13	**What are the types of statements in APT language?**	**BTL-1**	**Remembering**	**PO1,PO5,PO 6, PO7,PO8**
14	**Mention the uses of micro-machining.**	**BTL-1**	**Remembering**	**PO1,PO5,PO 6, PO7,PO8**
15	**What is point to point (PTP) system?**	**BTL-1**	**Remembering**	**PO1,PO4,PO 5,PO6, PO7**
16	**Distinguish between point to point and continuous path systems.**	**BTL-4**	**Analyzing**	**PO1,PO5,PO 6, PO7,PO9**
17	**What is a preparatory function?**	**BTL-1**	**Remembering**	**PO1,PO5,PO 6, PO7,PO8**
18	**What are G-codes and M-codes? Give examples.**	**BTL-1**	**Remembering**	**PO1,PO5,PO 6, PO7,PO8**
19	**What is the role of computer for NC machine tool?**	**BTL-1**	**Remembering**	**PO1,PO5,PO 6, PO7,PO8**
20	**Name the various elements of CNC machines.**	**BTL-1**	**Remembering**	**PO1,PO5,PO 6, PO7,PO8**
21	**What is meant by hybrid CNC?**	**BTL-1**	**Remembering**	**PO1,PO5,PO 6, PO7,PO8**
22	**State the limitations of CNC machine tools.**	**BTL-1**	**Remembering**	**PO1,PO5,PO 6, PO7,PO8**
23	**What do you mean by machining center with respect to NC machines?**	**BTL-1**	**Remembering**	**PO1,PO5,PO 6, PO7,PO8**
24	**State any four applications of CNC.**	**BTL-1**	**Remembering**	**PO1,PO5,PO 6, PO7,PO8**
25	**What are the types of micro machining?**	**BTL-1**	**Remembering**	**PO1,PO5,PO 6, PO7,PO8**
26	**Mention the advantages of stepping motor.**	**BTL-1**	**Remembering**	**PO1,PO2,PO 3,PO5**
27	**Mention the types of ball screws.**	**BTL-1**	**Remembering**	**PO1,PO2,PO 3,PO5**
28	**What are feed drives?**	**BTL-1**	**Remembering**	**PO1,PO2,PO 3,PO5**
29	**Define Subroutine.**	**BTL-1**	**Remembering**	**PO1,PO5,PO 6, PO7,PO8**
30	**What is adaptive control?**	**BTL-1**	**Remembering**	**PO1,PO5,PO 6, PO7,PO8**
	PART B& C			
1	**Explain the working of a NC machine tool with the help of a diagram. Also state advantages and limitations of NC**	**BTL-2**	**Understanding**	**PO1,PO5,PO 6, PO7,PO8**

	machines.			
2	**Discuss about the closed loop system and open loop system with a neat sketch and with suitable example.**	**BTL-6**	**Creating**	**PO1,PO5,PO 6, PO7,PO8**
3	**Describe the spindle drives, feed drives, slide ways used in CNC machines.**	**BTL-2**	**Understanding**	**PO1,PO5,PO 6, PO7,PO8**
4	**With a neat sketch explain the working of ATC and APT language.**	**BTL-2**	**Understanding**	**PO1,PO2,PO 3,PO5**
5	**Explain the various steps to be followed while developing CNC part program and also explain about linear and circular interpolation.**	**BTL-2**	**Understanding**	**PO1,PO5,PO 6, PO7,PO8**
6	**Write short notes on : Micro machining, Wafer machining and machining centres.**	**BTL-1**	**Remembering**	**PO1,PO2,PO 3,PO5**

UNIT I THEORY OF METAL CUTTING

Mechanics of chip formation, single point cutting tool, forces in machining, Types of chip, cutting tools – nomenclature, orthogonal metal cutting, thermal aspects, cutting tool materials, tool wear, tool life, surface finish, cutting fluids and Machinability.

PART – A

1. Classify the process of metal shaping? **(Apr 15)**

Process of metal shaping is classified into two types namely.

(i) Non-cutting shaping process
(ii) Cutting shaping process.

2. Explain the non-cutting shaping process? **(Apr 15)**

The metal is shaped under the action of force, heating or both. Since there is no cutting of metal, chip formation will not be there. So, it is called non-cutting shaping process.

3. Classify the relative motion between the work piece and cutting tool. **(NOV 15)**

(i) Rotation of work against tool. (**e.g.**) Turning.
(ii) Rotation of tool against work piece. (**e.g.**) drilling, Milling.
(iii) Linear movement of the work piece against the tool. (**e.g.**) Planer.
(iv) Linear movement of the tool against the work. (**e.g.**) Shaper.

4 What are the different types of cutting tool? **(NOV 15)**

(a) Single point cutting tool
(b) Multiple point cutting tool.

.

5. Mention the various angles in cutting tool. **(Nov 16)**

(1) Back rake angle (2) Side rake angle (3) End relief angle
(4) Side relief angle (5) Side cutting angle (6) End cutting angle.

6. What is tool signature? **(May 2017)**

The various angles of tools are mentioned in a numerical number in particular order. That order is known as tool signature.

7. What is the effect of back rake angle and mention its types? ?(May 2017)

Back rake angle of tool increases the strength of cutting tool and cutting action. It is classified into two types.Positive rake angle (2) Negative rake angle.

8. Explain the nose radius.

It is the joining of side and end cutting edges by means of small radius in order to increase the tool life and better surface finish on the work piece.

9. What are the conditions for using positive rake angle?

(i) To machine the work hardened materials.
(ii) To machine low strength ferrous and non-ferrous metals.

(iii) To turn the long shaft of small diameters.
(iv) To machine the metal below recommended cutting speeds.
(v) To machine the work piece using small machine tools with low horse power.

10. When will the negative rake angles be used? (May 13)

(i) To machine high strength alloys.
(ii) To machine tools are more rigid.
(iii) The feed rates are high.
(iv) To give heavy and interrupted cuts.

11.Define orthogonal and oblique cutting. (Nov '13, May' 17)

Orthogonal cutting: The cutting edge of tool is perpendicular to the work axis.

Oblique cutting: The cutting edge is inclined at an acute angle with normal to the cutting velocity vector is called oblique cutting process

12. What is shear plane?

The material of work piece is stressed beyond its yield point under the compressive force. This causes the material to deform plastically and shear off. The plastic flow takes place in a localized region called shear plane.

13. What is cutting force?

The sheared material begins to flow along the cutting tool face in the form of small pieces. The compressive force applied to form the chip is called cutting force.

14. What is a chip and mention its different types?

The sheared material begins to flow along the cutting tool face in the form of small pieces is called chip. Chips are mainly classified into three types:

a. Continuous chip
b. Discontinuous chip
c. Continuous chip with built up edge.

15. What is chip thickness ratio?

The ratio of chip thickness before cutting to chip thickness after cutting is called chip thickness ratio.

Chip thickness ratio, $r = t_1 / t_2 = l_1 / l_2$

16. What is chip reduction coefficient?

The reciprocal of chip thickness ratio is called chip reduction co-efficient.

$K = 1 / r$

17.Classify the different types of chip breakers.

a. Step type
b. Groove type
Clamp type

18.What are the cuttings forces acting on the cutting tool?

During the cutting process, the following three components of cutting forces are acting mutually right angles.

a.Feed force $\mathbf{F_x}$ acts in a horizontal plane but in the direction opposite to feed.

b.Thrust force F_y acts in a direction perpendicular to the generated surface.

c.Cutting force F_z acts in the direction of the main cutting motion.

.

19. What are the assumptions made in lee and Shaffer's theory?

a. The work ahead of the tool behaves as ideal plastic mass.

b. There exists a shear plane which separates the chip and work piece.

c.No hardening in chip occurs

20. What are the factors affecting the machinability?

a. Chemical composition of work piece material.

b. Microstructure of work piece material.

c. Mechanical properties like ductility, toughness etc.

d. Physical properties of work materials.

e. Method of production of the work materials.

.

21. How the machinability can be evaluated?

The following criteria are suggested for evaluating machinability.

a. Tool life per grind.

b. Rate of removal per tool grind.

c. Magnitude of cutting forces and power consumption.

d. Surface finish.

e. Dimensional stability of finished work.

f. Heat generated during cutting.

22. What is machinability index? (Nov 16, May 17)

It is a comparison of machinability of different material to standard material. US material standard for 100% machinability is SAE 1112 hot rolled steel.

23. Give two examples for orthogonal cutting. (May' 12)

Turning, Facing, Thread cutting and parting off

24. What is meant by built up edge?

The chip material to weld itself to the tool face near the nose.

25. What are the favourable factors for continuous chip with built up edge?

Low cutting speed, Small rake angle, Course feed.

26. How do you classify tool wear? (Nov '13, May '13)

Flank wear, Face wear, Nose wear

27. Name any two reasons for flank wear in cutting tools.

Friction, Abrasion, Adhesions and rough machined surface.

28. Define Tool life. (May'11, Nov '12)

It is defined as the time elapsed between two consecutive tool sharpening

29. Write Taylor's tool life equation. (Nov'14)

$V T^n = C$, where V = cutting speed in m/min, T = tool life in min, C = constant, n = index depends upon tool and work

30. Why is lubrication not required while machining cast iron?

The high carbon content in cast iron is present in the form of graphite. It acts a self-cooling agent while machining the cast iron.

PART – B & C

1. **How is metal removed in metal cutting? Explain the process with neat sketch. (May '14).**

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.1.2 &1.3.

2. **Explain the properties of cutting tool materials, essential requirements and classification of tool**

materials. **(May'13, Apr'14).**

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.1.80 & 1.82

3. **Explain Merchant circle diagram and derive the relation.** **(May'15, May'17)**

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.1.7 & 1.11.

4. **How chips are classified in metal cutting? What are the conditions for the formation of different types of chips?** **(May'15, MAY'17)**

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.1.20, 1.21, 1.22, 1.23 & 1.27.

5. **Define tool wear and explain the reasons of tool – failure.** **(Nov'13, May'14).**

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.1.88, 1.91, 1.92

6. **Write a short note on cutting fluids in metal cutting.** **(Nov'13, May'14)**

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.1.98, 1.99.

7.The Taylorian tool-life equation for machining C-40 steel with a 18:4:1 HSS cutting tool at a feed of 0.2 mm/min and a depth of cut of 2mm is given by $VT^n = C$, where n and C are constants. The following V and T observations have been noted.

V_1 m/min 25 35

T_1 min 90 20

Calculate:

i. **n and C**
ii. **Hence recommend the cutting speed for a desired tool life of 60 minutes. (May'09, May'11, May'13, May'15)**

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.1.107.

8.A specimen of 100mm length along the stroke of shaper is machined with a tool with 15° rake angle. The uncut chip thickness is 1.5mm. If a chip length of40mm is obtained during one stroke of machining, find the shear plane angle and thickness of cut-chip. **(May'12)**

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.1.32.

UNIT- II TURNING MACHINES

Centre lathe, constructional features, specification, operations – taper turning methods, thread cutting methods, special attachments, machining time and power estimation. Capstan and turret lathes- tool layout – automatic lathes: semi automatic – single spindle : Swiss type, automatic screw type – multi spindle.

PART – A

1. What is a lathe?

Lathe is a machine which removes the metal from a piece of work to the required shape and size

2. What are the various operations that can be performed on a lathe?

Turning, Facing, Forming, Knurling, Chamfering, Thread cutting, Drilling, Boring, Recessing, Tapping, Grooving etc.

3. What are the principles parts of a lathe?
Bed, Headstock, Tailstock, Carriage, Cross slide and Tool post

4. What is swing diameter?
The largest diameter of work that will revolve without touching the bed and is twice the height of the center measured from the bed of the lathe.

5.Write the specifications of a typical lathe.
1.Length of bed. 2. Maximum distance between dead and live centres. 3. Type of bed 4. Swing over the bed. 5. Swing over the cross slide. 6. The height of centres from the bed. 7. Width of the bed. 8. Spindle bore. 9. Spindle speed. 10. Feeds

6. Write down the names of any four lathe accessories.
Lathe centers, Catch plates, carriers, chucks, mandrels and rest

7.State the various parts mounted on the carriage.
Saddle, compound rest, cross slide, tool post

8.What are the functions of feed rod and lead screw?
Feed rod: It is used to guide the carriage in a straight line when it moves along the bed.

Lead Screw: It is used to move the carriage while thread cutting operation is carried out. It also ensures the proper speed of work relative to the tool for thread cutting operation.

9. What is an apron?
Apron is an integral part of several gears, levers and clutches which are mounted with the saddle for moving the carriage along with lead screw while thread cutting..

10. Mention different types of chucks used in a machine shop.
Three jaw chuck, Four jaw chuck, Magnetic chuck.

11. What is the application of air operated chuck?
Heavy work pieces are mounted with the help of air operated chucks, because they will require more power to hold the work pieces.

12. What are the advantages of a collet chuck?
Job setting will be easier and quicker, Heavy cut can be taken

13. What is the purpose of mandrel and its types?
It is used for holding hollow work pieces.

Types: Plain, Collar, Special, Step & Gang.

14. Calculate the time required for one complete cut on a piece of work having 250mm long and 40mm diameter. The cutting speed is 32 m/min and the feed is 0.4 mm/sec.

Given data: L = 250mm, D = 40mm, V = 32 m/min, F = 0.4 mm/rev.

Solution: $V = \Pi DN / 1000$

$N = 1000 * 32 / \pi * 40 =$ **255 rpm.**

Number of revolution required for one complete cut, Y

$Y = L / f = 250 / 0.4 =$ **625 rev.**

Time required for one complete cut, Y / N = 625 / 225 = **2.5 min.**

15. Define tool room lathe.
A tool room lathe consists of all the necessary attachments required for accurate and precision machining.

16. What are the advantages of semi automatic lathe?

Production time is minimized, accuracy will be high and production rate is increased.

17 Define automatic machine?

Automatic machine or simply automates are machine tools in which all the operations required to finish off the work piece are done automatically without the attention of the operator.

18. What is the purpose of tumbler gear mechanism of a lathe?

It is used to change the direction of lead screw and feed rod relative to spindle rotation. By engaging the tumbler gear, the carriage can be moved along the lathe axis in either direction during thread cutting or auto machining.

19. What is thread cutting operation?

It is the operation of producing continues helical groove on a cylindrical work piece.

20. List the various thread cutting methods.

Reversing the machine, Marking the lathe parts, Using a thread indicator, U sing thread chaser.

21. What is a Centre guage that is used in threading?

It is a tool used in machining to check the angle of the tool bits used to screw threads.

22. Mention any two limitations of a Centre lathe.

i. Setting time is more to fix the job on a lathe.
ii. Only one tool can be used at a time.
iii. Idle time to set and move the tools are large.

23. Compare the advantages of turret lathe over capstan lathe.

Heavier and larger work piece chucking can be done. More rigid, hence it withstands heavy cuts

24. What is the difference between a ram-type turret lathe and saddle type turret lathe?

s.no	Capstan lathe	Turret lathe
1	Turret head is mounted on a ram which slides over the saddle.	Turret head is directly mounted on a saddle. But it slides on the bed
2	Shorter w/p can be machined.	Larger w/p can be machined.
3	Turret head can be moved manually.	Turret head cannot be moved manually.
4	It is very much useful in light duty applications.	It is very much useful in heavy duty applications.

25. State the different methods of turning taper.(Nov'16,May'17)

- Form tool method
- Tail stock set over method
- Compound rest method
- Taper turning attachment method

26 What are programmed automatic lathes?

To produce parts by means of cams, stops or other mechanical methods.

27. State the advantages of swiss type screw cutting machine.

- Wide range of speeds
- Micrometer tool setting
- Interchangeability of cams
- Numerous working stations

28. What are the advantages of single spindle automatic lathe?

Automatic cutting off, Automatic screw cutting & Swiss type automatic screw machine.

29. What is Swiss type automat?

The work is fed against the tool. The head stock carrying the bar stock moves back and forth for providing the feed movement in the longitudinal direction.

30. What is bar stop?

It is the work stop. It is used for setting the required length of the work piece..

PART – B & C

1.Describe the work holding devices and mechanisms in a lathe. (May'13, May'14)

Ref: manufacturing tech. II by G.K. Vijayaragavan Page no.2.23, 2.24, 2.28, 2.14 2.18.

2. Explain the specification of a lathe and various attachments used on a centre lathe. (May'17, May' 14)

Ref: manufacturing tech. II by G.K. Vijayaragavan Page no.2.9, 2.64

3. Explain with neat sketches the working principle of taper turning operation with different methods. (May'11, Nov'13, May'14).

Ref: manufacturing tech. II by G.K. Vijayaragavan Page no.2.49, 2.50, 2.51, 2.52.

4. Explain parallel action and progressive action multi spindle automatics. (Nov'16, May'14)

Ref: manufacturing tech. II by G.K. Vijayaragavan Page no.2.126, 2.127.

5. Explain the working principle of turret lathe and Geneva mechanism of turret lathe. (Nov'16, Dec'11, May'13, May'17).

Ref: manufacturing tech. II by G.K. Vijayaragavan Page no.2.80, 2.81.

6. Describe the working principle of Automatic cutting off machine and Swiss type automatic lathes. (May'11, Dec'11, May'17, Nov'13).

Ref: manufacturing tech. II by G.K. Vijayaragavan Page no.2.116, 2.117.

UNIT III SHAPER, MILLING AND GEAR CUTTING MACHINES

Shaper - Types of operations. Drilling ,reaming, boring, Tapping. Milling operations-types of milling cutter. Gear cutting – forming and generation principle and construction of gear milling ,hobbing and gear shaping processes –finishing of gears.

PART – A

1. **What are the specifications of milling machines?**

   The table length and width, number of spindle speeds and feeds, power of driving motor, floor space and the net weight.

2. **Mention the various movements of universal milling machines.**

   Vertical movement with through the knee, crosswise movement through the saddle, longitudinal movement of the table and angular movement of the table by swiveling the table on the swivel base.

3. **What are the different ways for machining work pieces in Plano milling?**
   - By moving the table, the cutters rotating in position
   - By keeping the table stationary and feeding the cutters by moving the milling heads
   - By moving the table and the milling heads simultaneously.

4. **What are the different ways for machining work pieces in Plano milling?**
   - By moving the table, the cutters rotating in position
   - By keeping the table stationary and feeding the cutters by moving the milling heads
   - By moving the table and the milling heads simultaneously.

5. Write nomenclature of plain milling cutter.

Body of cutter, cutting edge, face, fillet, gash, lead, land, outside diameter, root diameter, cutting angles.

6. Differentiate up milling and down milling.

s.no	Event of operation	Up milling	Down milling
1	Direction of travel	Cutter rotates against the direction of travel of work piece.	Cutter rotates in the same direction of travel of work piece.
2	Chip thickness	Minimum at the beginning of the cut	Maximum at the beginning of the cut
3	Cutting force	Increases from zero to maximum per tooth	Decreases from maximum to zero per tooth

7. How do you specify radial drilling machine.

- Maximum size of the drill in mm that the machine can operate.
- Table size of maximum dimensions of a job can mount on a table in square meter.
- Maximum spindle travel in mm.
- Number of spindle speeds and range of spindle speeds in rpm

8. Write down any four operations that can be performed in a drilling machine.

- Drilling
- Counter sinking
- Tapping
- Trepanning

9. What is meant sensitive hand feed?

In drilling machine, manual sensing of the hand does feeding of the tool towards the work piece. It is called sensitive hand feed.

10. What are the applications of boring?

For machining large and heavy work piece in mass production work of engine frame, cylinder, machine housing etc,

11. Mention any four shaper specification.

- Maximum length of stroke
- Type of driving mechanism
- Power of the motor
- Speed and feed available

12. Write down any four operations that can be performed in a shaping machine.

- Machining horizontal surfaces.
- Machining vertical surfaces.
- Machining inclined surfaces.
- Machining irregular surfaces.

13. What are the various forming methods for manufacturing gears?

- Gear cutting by single point form tool
- Gear cutting by shear speed shaping process
- Gear milling using a formed end mill
- Gear broaching

14. List the gear generating process.

- Gear shaping process
- Gear planning process
- Gear hobbing process

15. Give the functions of flutes on taps.

It provides cutting edges, It conducts the cutting fluid to the cutting region

16. What is deep hole drilling?

Drilling any hole more than 4 to 5 times of its diameter.

17. State the nomenclature of a standard drill.

Body, Shank, Neck, Point & Land.

18. Define reaming.

It is the operation of finishing and sizing hole which is already drilled while the work is revolved at a very slow speed.

19. What are the work holding devices used in milling machines?

'V' blocks, Machine vice, Milling fixture & Dividing heads.

20. How do you classify milling cutters?

According to the types of operation, way of mounting on the machine, shape of the tooth.

21. What is gear hobbing process?

The process of generating a gear by means of a rotating cutter call hob.

22. Mention any two advantages of gear hobbing.

Used in mass production, Perfect tooth profile obtained.

23. What are the limitations of gear hobbing?

Internal gears cannot be generated, Hobbing process cannot be applied very near to shoulders.

24. What is meant by plain or slab milling?

It is the operation of producing flat horizontal surfaces parallel to the axis of the cutter using a plain or slab milling cutter

25. What is climb milling?

The cutter rotates in the same direction of travel of the work piece.

26. What are the two types of arbor?

Standard arbor & Stud arbor

27. Define boring.

It is the process of enlarging and locating previously drilled holes with a single point cutting tool.

28. Define the metal removal rate.

It is the volume of metal removed per unit time.

mmr (**or**) **w = f.t.L.S**

29. List any two types of quick return mechanism.

Hydraulic drive mechanism, Crank and slotted lever mechanism.

30. What is gang drilling machine?

When a number of single spindle with essential speed and feed are mounted side by side on one base and have common work table.

PART – B & C

1. Explain the principle of operation of a shaper machine with a neat sketch. (Dec'10, May'15).

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.3.1

2. Describe with neat sketch the drive mechanisms used in shaper. (Nov'16, May'17,Dec'11, May'15).

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.3.8, 3.10, 3.11.

3.Sketch and explain the working principle of upright and radial drilling machine and twist drill (Dec'10, Apr'17).

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.3.39, 3.41.

4. Sketch the following operations performed in drilling machine. i. Drilling ii. Reaming iii. Boring iv. Counter boring v. Counter sinking vi. Spot facing vii. Tapping viii. Trepanning (May'10, May'12).

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.3.49.

5. Explain the working of Jig boring and Vertical boring machine with neat sketch. (Dec'11, May'13).

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.3.76, 3.84.

6. Explain the horizontal knee type milling machine and types of milling cutters with neat sketch. (Dec'10, Dec'11, Nov'16).

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.3.90, 3.106, 3.111.

7. Explain the principle of operation of gear hobbing, gear shaving, gear shaping, gear finishing and gear forming. (Dec'10, Nov '16, May'17).

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.3.153, 3.161, 3.164, 3.167.

UNIT IV ABRASIVE PROCESS AND BROACHING

Abrasive processes: grinding wheel – specifications and selection, types of grinding process– cylindrical grinding, surface grinding, centreless grinding and internal grinding- Typical applications – concepts of surface integrity, broaching machines: broach construction – push, pull, surface and continuous broaching machines

PART – A

1. What is the process of self-sharpening of the grinding wheel?

During machining, the blunt abrasive grains will be released from the wheel surface. In their place, new abrasive grains project from the surface of the wheel. This process is called self-sharpening of the grinding wheel.

2. Define grinding.

Grinding is a metal removing process in which the metal is removed with the help of a rotating grinding wheel.

3 What is meant by centreless grinding?

Centreless grinding is performed on work pieces which do not have centres, such as pistons, valves, rings, tubes, balls, wrist pins, drills, bushings, shafts etc. Centreless grinding can be done on both

external and internal cylindrical surfaces.

4. What are the types of surfaces that could be produced using plain cylindrical grinders?

Plain cylindrical parts, cylinders, tapers, shoulders, fillets, cams, crankshaft.

5. State any four advantages and disadvantages of centreless grinding.

Advantages:

- Work holding devices like chucks, dogs, centres, mandrels are not required.
- Wide range of components can be ground.
- Very little skill is required for the operator.

Disadvantages:

- Work with flats and key ways cannot be ground.
- Work pieces with step and multiple diameters cannot be ground easily.
- In hollow work, there is no certainity that the outside diameter will be concentric with the inside diameter.

6. What are the types of surface grinders?

Horizontal spindle reciprocating table surface grinder, Horizontal spindle rotary table surface grinder, Vertical spindle reciprocating table surface grinder, Vertical spindle rotary table surface grinder.

7. What is a tool post grinder?

They are used for miscellaneous and small grinding work on a lathe.

8. Give examples to natural abrasives and artificial abrasives.

Natural abrasives:

- Corundum (75% to 90% crystalline Al_2O_3 + Iron oxide)
- Diamond

Artificial abrasives:

- Aluminium oxide , Silicon carbide

9. Define the following terms used in grinding wheel:

(i) Loading and (ii) Glazing

Loading:

During the operation, the chips formed get entrapped in the inner granular space of abrasive particles. This is called loading.

Glazing:

The surface of the wheel becomes smooth and gets a glass like appearance. This is known as glazing of the wheel.

10. What is meant by "grade" and "structure" of a grinding wheel?

Grade or hardness indicates the strength with which the bonding material holds the abrasive grains in the grinding wheel.

Structure denotes the spacing between the abrasive grains or in other words the density of the wheel.

11. Mention the types of grinding operation performed on a cylindrical grinding.

Traverse grinding, Plunge grinding.

12. What are the specifications of a grinding wheel?

Types of abrasives, Grain size or grit number, Grade of the wheel, Structure, Type of bond, Manufacturer's code

13. State the various methods of centreless grinding.

Through feed, In feed, End feed

14. What are grinding points?

The bonded abrasive stones in the grinding process.

15. What is the use of swing frame grinder?

It is used to snagging the castings which are too heavy and large in nature.

16. Name the two types of bond.

Organic and Non-organic.

17. What is meant by dressing and truing?

Dressing is the process of loading and breaking away the glazed surface so that new sharp abrasive particles are again present to work for efficient cutting.

Truing is the process of trimming the cutting surface of the wheel to run true with the axis.

18. What is the process of lapping?

Lapping is a surface finishing process used for producing geometrically accurate flat, cylindrical and spherical surfaces

19. What is meant by honing?

An abrading process of finishing previously machined surfaces is known as honing.

20. Indicate any two specification of broaching machine.

- Maximum length of stroke in mm.
- Maximum force developed by the slide in tones.

21. How will you classify the broaching machine?

According to the nature and direction of primary cutting motion, Purpose, Method of operation, Construction of the broach tool, Function, number of main slides or tations, motion of the broah tool relative to the work.

22. What are the advantages and limitations of broaching?

Advantages:

1. Roughing, semi finishing and finishing cuts are completed in one pass of the broach

2. Broaching can be used for either external or internal surface finish

Limitations:

1. High initial cost of the broach tool when compared to other tools

2. Job work or batch work is not advisable due to the high tool cost

23. What is the main difference between pull down and pull up type vertical broaching machine?

- This broach is used in push type broaching machine in which the broach is pushed through work during broaching.
- This broach is pulled through work during broaching

.

24. List all the Nomenclature of a broaching tool.

Roughing teeth, semi finishing teeth, finishing teeth, pull end, front pilot, back off or clearance angle, pitch and rack or hook or face angle

25. What are the various types of continuous broaching machines?

Horizontal, vertical and rotary type.

26. What is broaching?

It is a process of machining a surface with a special multi point cutting tool called broach which has successively higher cutting edges in a fixed path.

27. List four applications of broaching machines.

Straight and helical slots, External surfaces of various shape, External and internal toothed gears, Holes of cross sectional shape.

28. List some of the materials of broaching tools.

High-speed tool steels such as alloy steel and stainless steel, Tin coated carbides, Aluminium, Brass

29. What are the different operations that can be performed on a broaching machine?

Broaching splines, Broaching a keyway.

30. Classify vertical broaching machines.

Pull up type, Pull down type, Push down type

PART B & C

1. Discuss the various bonding materials and abrasives used for making grinding wheels. (May'11, May'14, Nov' 16).

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.4.2, 4.5

2. Explain the working principle of cylindrical, surface and centreless grinding process. (Nov' 16,May'12, May'13).

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.4.20, 4.13, 4.26, 4.36.

3. Classify the grinding machines, factors considered to select grinding wheels also explain about truing and dressing. (May'17, May'13, May'15).

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.4.13, 4.20, 4.16, 4.18.

4. Write briefly about broaching machines and its operations with neat sketches. (May'17, Nov'13, Nov' 16).

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.4.54, 4.56.

5. Discuss push and pull type broaching machines with neat sketches. (May'11, May'15 Nov' 16).

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.4.57, 4.58, 4.59

6. Explain the working principles of continuous broaching machine and also state the advantages and limitations of broaching. (May'11, May'15).

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.4.60, 4.52.

UNIT V – CNC MACHINING

Numerical Control (NC) machine tools – CNC types, constructional details, special features, machining centre, part programming fundamentals CNC – manual part programming – micromachining – wafer machining

PART – A

1. State the advantages of NC machines?

- Greater accuracy
- Lesser production cost per piece due to reduction in lead time and also set up time
- Improved product quality and provision of high order of repeatability

2. What is meant by numeric control?

1. Controlling a machine tool by means of a prepared programme

3. List the various types of NC machines?

- Point to point NC system
- Straight cut NC system
- Contouring NC system

4 List the various components of DNC?

- Central computer
- Bulk memory which stores the NC part programs.
- Telecommunication lines
- Machine tools

5. State the advantages of CNC machines?

- Highly flexible
- Good error correction property

6. What is meant by 'tool magazine' in a CNC machine?

In CNC machines, the tool magazine is an index able tool holding device which accommodates several tools in the form of packets along with specified packet number in such a way to easily identify it. This arrangement helps to obtain an automatic tool changing.

7.Differentiate between CNC and DNC.

CNC system can do operations on only one machine at a time, but DNC involves that at a time a large central computer to direct the operations of a number of separate NC machines

8. Compare a closed loop NC system with open loop system.

s.no	Open loop system	Closed loop system
1	No feedback about the result produced due to open loop.	Instantaneous feedback about the result produced.
2	No reference for the results.	Definite reference for the results.
3	It is relatively cheap.	It is costlier.

9. Classify the CNC machines.

- CNC machining centre
- CNC turning centre
- CNC special purpose machines

10 List the methods of creating part programming.

- Manual part programming.
- Computer assisted part programming.
- Computer automated part programming.

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11 **What is meant APT program?**

- APT program is used to command the cutting tool through its sequence of machining process
- APT is also used to calculate the cutter position
- APT is a three dimensional system controlling upto 5 axis including rotational coordinates

12. **What are the canned cycles?**

A canned cycle is the combination of machine moves that performs any one particular machining function such as drilling, turning, milling, boring, tapping etc,.

13. What are the types of statements in APT language?

- Geometric statements
- Motion statements
- Post processor statements
- Special control or auxiliary statements

14. **Mention the uses of micro-machining.**

- It is used to create parts of size in the order of 10^{-6} meters.
- It is used to create Micro Electro-Mechanical Systems (MEMS devices), Integrated circuits etc.

15. What is point to point (PTP) system?

It is also called positioning system. The objective of the machine tool control is to move the cutting tool to a predefined location. The speed or path is not important in this system.

16. Distinguish between point to point and continuous path systems.

s.no	Point to Point system	Continuous system
1	It is the simplest form.	It is quiet complex in nature.
2	The speed of movement is more.	The speed is less.
3	Preparing part programme is easier.	It is quiet complex.

17. What is a preparatory function?

Preparatory commands which prepare the machine or tool for different modes of movement such as positioning contouring, thread cutting and also precede the dimension word.

18. What are G-codes and M-codes? Give examples.

G-codes are preparatory function codes which prepare the machine or tool for different modes of movement such as positioning, contouring, thread cutting.

Eg: G00 – Point to point positioning

G01- Linear interpolation

M-codes are miscellaneous function which denotes the auxiliary or switching information coolant on/off, spindle speed.

Eg: M00 – Programme stop

M01 – Optional stop.

19. What is the role of computer for NC machine tool?

It is an NC system that utilizes the stored programme to perform basic numerical control functions. Mini or microcomputer based controller unit is used.

20. Name the various elements of CNC machines.

Tape reader, Minicomputer, Servos and interface logic.

21. What is meant by hybrid CNC?

The controller consists of soft-wired and hard-wired logic circuits.

22. State the limitations of CNC machine tools.

ii. More expensive

CNC operator needs basic training and skills

23. What do you mean by machining center with respect to NC machines?

It is a machine tool capable of performing several different machining operations on a work piece under one control programme in a single setting.

24. State any four applications of CNC.

Welding machines, Press working machine tools, Assembly machines, Inspection machines.

25. What are the types of micro machining?

Bulk and Surface.

26. Mention the advantages of stepping motor.

It is used in open loop NC system, Cheaper, More accuracy.

27. Mention the types of ball screws.

By ball circulation method: Return pipe type, Deflector type

By preloading method: Constant pressure preloading type

By screw shaft: Precision & Rolled ball screws

28. What are feed drives?

They are used to drive the axis as per the programme fed in CNC machine.

29. Define Subroutine.

If the same machining operation which was carried out already is to be performed at many different positions on the work iece, it can be executed by means of a programme.

30. What is adaptive control?

The automatic monitoring and adjustment of machining conditions in response to variations in the operation performance

PART B&C

1. Explain the working of a NC machine tool with the help of a diagram. Also state advantages and limitations of NC machines. (May'17, May'14).

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.5.14, 5.33.

2. Discuss about the closed loop system and open loop system with a neat sketch and with suitable example. (May'17, Nov'13).

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.5.15, 5.16.

3. Describe the spindle drives, feed drives, slide ways used in CNC machines. (May'11, May' 12, May'13).

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.5.39, 5.41, 5.42, 5.43.

4. With a neat sketch explain the working of ATC and APT language. (May'12, May'14).

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.5.44, 5.98.

5. Explain the various steps to be followed while developing CNC part program and also explain about linear and circular interpolation. (Nov'16, May'14, May'15).

Refer manufacturing tech. II by G.K. Vijayaragavan Page no.5.66, 5.83, 5.84.

6. Write short notes on : Micro machining, Wafer machining and machining centres. (May'17, Nov'13).

Refer manufacturing tech. II by G.K. Vijayaragavan Page no. 5.48, 5.105, 5.107.