1. What is meant by the cutting shaping process? (N-08, M-12)
The required shape of metal is obtained by removing the unwanted material from the work piece in the form of chips is called cutting shaping. Example: Turning, Drilling, Milling, Boring etc.

2. Classify the various relative motion between work piece and cutting tool. (N-10, M-11)
   (i) Rotation of work against the tool. Example: Turning,
   (ii) Rotation of tool against work piece. Example: Drilling, Milling,
   (iii) Linear movement of the work piece against the tool. Example: Planer,
   (iv) Linear movement of the tool against the work. Example: Shaper.

3. What are the different types of cutting tool? (N-09, M-13)
   (i) Single point cutting tool (ii) Multiply point cutting tool.

4. Classify the various angles in cutting tool. (M-06, M-10)
   1) Back rake angle 2) Side rake angle 3) End relief angle 4) Side relief angle 5) Side cutting angle 6) End cutting angle.

5. What is tool signature? (N-08)
The various angles of tools are mentioned in a numerical number in particular order. That order is known as tool signature

6. When will the negative rake angles be used? (N-13, M-08)
   a. To machine high strength alloys.
   b. The machine tools are more rigid.
   c. The feed rates are high.
   d. To give heavy and interrupted cuts.
7. Classify the types of metal cutting process.
   The metal cutting processes are mainly classified into two types.
   a. Orthogonal cutting process (two dimensional cutting),
   b. Oblique cutting process (Three dimensional cutting).

8. Define- Orthogonal and oblique cutting.
   Orthogonal cutting :- The cutting edge of tool is perpendicular to the work piece axis.
   Oblique cutting :- The cutting edge is inclined at an acute angle with normal to the cutting velocity vector is called oblique cutting process.

9. 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 is called shear plane.

10. 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.

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

12. What are the purposes of chip breakers?
    The chip breakers are used to break the chips into small pieces for removal, safety and to prevent to machine and work.

13. What is the difficulty of long and continuous chips?
    During machining, long and continuous chip that are formed at high cutting speed will affect machining. It will spoil tool, work and machine. These chips are hard, sharp and hot. It will be difficult to remove metal and also dangerous to safety.

14. Classify the different types of chip breakers.
    The chip breakers are classified into three types:-

15. What are the cuttings forces acting on the cutting tool?
    During the cutting process, the following three component of cutting forces acting mutually right angles.
    a. Feed force Fx acts in a horizontal plane, but in the Direction opposite to feed.
    b. Thrust force Fy acts in a direction perpendicular to the generated surface.
    c. Cutting force Fz in the direction of the main cutting motion.
16. What are the assumptions made in Merchant circle diagram?  
   a. The chip formation will be continuous without built up edge.  
   b. During cutting process cutting velocity remains constant,  
   c. The cutting tool has a sharp cutting edge so that it does not make flank contact to the work piece.

17. Define - Machinability of metal.  
Machinability is defined as the ease with which a material can be satisfactorily machined.

18. 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.

19. What are the tool variables affecting the machinability?  
   a. Tool geometry and tool material.  
   b. Nature of engagement of tool with the work.  
   c. Rigidity of tool.

20. What are the machine variables affecting the machinability?  
   a. Rigidity of machine.  
   b. Power and accuracy of the machine tool.
PART – B (16 Marks)

1. a. Explain the classification of various cutting tool materials?  
   b. State the properties of each of the tool materials.

2. a. The Taylor tool life equation for machining C-40 steel with a HSS cutting tool at a feed of 0.2mm/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

   | $V$, m/min | 25 | 35 |
   | $T$, min   | 90 | 20 |

   Calculate
   (1) $n$ and $C$
   (2) Hence recommend the cutting speed for a desired tool life of 60min.

   b. In an orthogonal cutting operation on a work piece of width 2.5mm, the uncut chip thickness was 0.25mm and the tool rake angle was zero degree. It was observed that the chip thickness was 1.25mm. The cutting force was measured to be 900N and the thrust force was found to be 810 N
   (a) Find the shear angle.
   (b) If the coefficient of friction between the chip and the tool, was 0.5, what is the machining constant $C_m$?

3. What is a chip breaker? Describe the different types of chips produced during metal machining with neat sketches.

4. With the help of a sketch, show crater wear and flank wear on a cutting tool.

5. a. What is machinability? And explain.
   b. Mention the functions and properties of cutting fluids

6. Describe an expression for the determination of shear angle in orthogonal metal cutting.

7. a. Describe the mechanism of metal cutting?
   b. What is meant by orthogonal cutting and oblique cutting?

8. Explain “merchant force circle” along with assumptions.

9. What are the standard angles of cutting tool? Illustrate with an example.

10. a. State the parameters that influence the life of tool and discuss?
    b. Explain the geometry of a single point cutting tool with suitable sketches?
1. What are the various operations that can be performed on a lathe? (M-06, M-08)

2. What are the principle parts of a lathe? (M-12)
   1) Red 2) Headstock 3) Tailstock 4) Carriage 5) Cross-slide 6) Tool post

3. What is the main requisite of a lathe bed? (N-08, N-13, M-14)
   The lathe bed should be very strong to withstand cutting forces and vibrations during machining.

4. What are the uses of headstock? (N-09)
   1) Headstock carries a hollow spindle with nose to hold the work piece.
   2) To mount the driving and speed changing mechanisms.

5. What is the main difference between live center and dead center? (N-09, M-12)
   i. Live center drives and rotates along with the work pieces.
   ii. Dead center is driven by headstock and it just supports the other end of the work.

6. State the various parts mounted on the carriage. (N-08)

7. What is a compound rest? (N-08, M-14)
   A member or part, which is mounted on the top of the cross slide having a base graduated in degrees.

8. List any four types of lathes. (N-05)
   1) Engine lathe. 2) Bench lathe. 3) Tool room lathe 4) Semi-automatic lathe. 5) Automatic lathe.

9. What is a semi-automatic lathe? (N-08)
   A lathe in which all the machining operations are performed automatically and loading and unloading of work piece, coolant on or off is performed manually.

10. What are the advantages semi-automatic lathes? (N-08, M-14)
    1) Production time is minimized.
    2) Accuracy will be high.
    3) Production rate is increased.

11. What is an automatic lathe? (N-08)
    In addition to automatic machining operations loading and unloading are also performed automatically.

12. Define feed. (N-05)
    Feed is defined as the movement of the tool relative to the work, the work piece by form tool.
13. State the various feed mechanisms used for obtaining automatic feed. (N-05)
   1) Tumbler gear mechanism
   2) Quick change gearbox.
   3) Tumbler gear-Quick change gearbox.
   4) Apron mechanism.

14. List any four work holding devices. (N-08)
   1) Chucks,
   2) Centres,
   3) Face plate.
   4) Angle plate.

15. Mention the use of chucks. (N-13)
    Chucks are used to hold the work piece of small length and large diameter.

16. What are the various types of chucks? (N-08, M-14)
    1) Three jaw chuck (or) Self centering chuck.
    2) Four jaw chuck or Independent chuck.
    3) Magnetic chuck.

17. What is the use of Mandrels? (N-08)
    Mandrels are used for holding hollow work pieces.

18. Define steady and follower rest. (N-13)
    Steady rest:-
    It is fixed on bed ways of the lathe by clamping the bolts.
    Follower rest:-
    The saddle is mounted on the saddle and moves together with the tool.

19. What are the different operations performed on a lathe? (N-08, M-14)
    1) Centering  2) Straight turning  3) Rough turning  5) Shoulder turning  7) Chamfering
    4) Finish turning  6) Facing  8) Knurling etc.

20. Define filing operation. (N-13)
    Filing is the process of removing bars, sharp corners and feed marks on a work piece by removing very small amount of metal.
1. Explain the various taper turning methods? (N-08, M-14)

2. a. Discuss about special attachments of lathe. (N-13)
   b. Mention the specifications of lathe with a neat sketch.

3. a. Describe the turret indexing mechanism. (N-08, M-14)
   b. Discuss about the bar feed mechanism.

4. a. Describe the holding devices in a lathe. (N-13)
   b. Explain the working principle of apron mechanism with neat sketch.

5. Draw neat sketches of steady and follower rests and brief their applications. (N-05)

6. Describe the constructional features of Swiss type automatic screw machine. (N-08, M-14)

7. Explain the working principle of a capstan and turret lathe. (N-13)

8. Name the various lathe accessories. How does a four jaw chuck differ from a three jaw chuck? (N-05)

9. Explain the features and classification of multi spindle automatics. (N-08, M-14)

10. a. Discuss the features of ram type and saddle type Turret. (N-13)
    b. What is meant by “Tool layout” of a Turret lathe?
1. What is shaper? (M-14, M-10)
The shaper is a reciprocating type of machine tool intended to produce flat surface. These surfaces may be horizontal, vertical or inclined.

2. Classify the shapers according to the reciprocating of ram. (N-06)
i. Crank type.
ii. Hydraulic type.
iii. Geared type.

3. Classify the shapers according to the travel and position of the ram. (N-06)
a. Horizontal type,
b. Vertical type,
c. Traveling head type.

4. Classify the shaper according to the design of table. (M-14, M-10)
a. Standard type,
b. Universal type.

5. Classify the shaper according to the type of cutting stroke. (N-07, M-12)
a. Push type,
b. Draw type

6. List the different types of parts involved in the shaper. (M-15)

7. List the parts in the tool head. (N-07, M-12)
a. Swivel base, b. Vertical slide, c. Apron, d. Tool post

8. List the parts in apron. (M-13)
a. Clapper box, b. Clapper block, c. Tool post

9. What are the different types of mechanism used in shaper? (N-07, M-12)
a. Crank and slotted Mechanism
b. Whit worth mechanism
c. Hydraulic shaper mechanism

10. List the two blocks used in the Crank and slotted Mechanism. (M-14, M-10)
11. What is a Crank and slotted Mechanism?  
The rotary motion of the bull gear is transmitted in to reciprocating motion of the ram through the rocker arm.

12. What are the different types of adjustments made in the Crank and slotted Mechanism?  
a. Adjusting the length of stroke.  
b. Adjusting the position of the stroke.

13. What is the use of a shaper dog in hydraulic shaper mechanism?  
It is used to change the position of the flow to facilitate the reciprocating motion.

14. What are the advantages of hydraulic shaper mechanism?  
a. The cutting and return speed is partially constant throughout the stroke  
b. Infinite number of cutting may be obtained from zero to maximum value and control easier.

15. What are the work holding devices used in shaper?  
1. Clamping the vise  
2. Clamping on the table  
3. Clamped to the angular plate.

16. What are the devices used to hold the work onto the table?  
a. T bolt and clamps  
b. Stop pins  
c. Strip and stop pins

17. What are the different operations performed by using shaper?  
1. Horizontal surface, 2. Vertical surface, 3. Angular surface,  
4. Cutting slot and key ways, 5. Irregular surface

18. What is a planer?  
The planer like a shaper is a machine tool primarily intended to produce plane and flat surfaces by a single point cutting tools. It is used to machining a large work piece which cannot accommodate by shaper table.

19. What is the difference between a shaper and planer?  
The fundamental difference between shaper and planer is that in a planer the work which is supported on the table reciprocate and the cross wise and perpendicular movement of the tool but shaper the tool reciprocate cross wise and vertical movement of the table.
20. What are the types of planer? (M-14, M-10)
   a. Double housing planer
   b. Open side planer
   c. Pit planer
   d. Edge or plate planer
   e. Divided table planer
PART – B (16 Marks)

1. a. Explain various milling cutters with neat sketches? (N-09, M-12)
   b. How will you cut the following types of surfaces on milling machines?
      (i) Flat surfaces (ii) Slots and splines

2. Discuss various hole making processes. (M-13)

3. With a neat sketch explain the column and knee type milling machine and name its main parts. (M-14)

4. a. Explain hacksaw and band saw with neat sketches. (M-12)
   b. Explain the different types of table drive and feed mechanisms in a planning machine.

5. a. Discuss push and pull type broaching machines with neat sketches. (M-15)
   b. Write short notes on expanding hand reamers and adjustable machine reamers.

6. a. Sketch and explain the hydraulic drive of a horizontal shaper. (N-09, M-12)
   b. Describe the working of a crank and slotted link mechanism.

7. a. Discuss the principle of operation of a shaper with a neat sketch. (M-14)
   b. Make a note on different types of work holding devices used in a slotting machine.

8. What are the operations performed on a drilling machine? (N-09, M-12)

9. b. Explain different types of drilling machines with their special features?

10. a. List out the differences between shaper and planner. (M-14)
    b. Explain with a sketch “Fast and loose pulleys” quick return mechanism of a planer table.
UNIT – IV : ABRASIVE PROCESS AND BROACHING

PART – A (2 Marks)

1. What is meant by Grinding? (M-08)
Grinding is a metal removal process or operation performed by means of rotating abrasive wheel that acts as a cutting tool against the work piece.

2. Why is grinding called finishing process? (N-08, M-10)
Grinding is called finishing process, because the grinding process removes metal usually in the order of 0.25 to 0.50 mm. Which produces very high quality surface finish.

3. What is the approximate thickness of metal removed in grinding operation? (M-08, M-12)
The approximate thickness of metal removed in grinding operation is 0.01 to 0.03 mm.

4. What are the main types of grinding? (M-14)
The two main types of grinding are:
   a) Rough or Non -precision grinding, b) Precision grinding.

5. What are the different types of rough grinders? (M-10)
a) Floor stand and bench type grinders b) Portable and flexible shaft grinders c) Swing frame grinders d) Abrasive belt grinders.

6. What are the types of precision grinders? (N-09, M-12)
a) Cylindrical grinders b) Internal grinders c) Surface grinders d) Tool and cutter grinders e) Special grinding machines

7. What is surface grinding? (N-09, M-12)
Surface grinding is the process of producing and finishing flat surfaces by means of a grinding machine using a revolving abrasive wheel.

8. What are the types of surface grindings? (M-14)
The different types of surface grindings are:
1. Reciprocating table surface grindings-
   a. Horizontal type b. Vertical type.
2. Rotating table-

9. What types of work can be ground by a surface grinder? (N-09, M-12)
Surface grinder can be used for flat surface, irregular surface, curved surface, tapered surface, convex surface and concave surface.
10. What are the types of internal grinders?  
The different types of internal grinders are:  
1. Chucking grinders  
a) Plain  
b) Universal  
2. Planetary grinders  
3. Centreless grinders  

11. What is the use of internal grinders?  
Internal grinders are used to finish straight, tapered, or formed holes to correct size, shape and finishing.  

12. What are the different types of external grinders?  
External grinders are divided into  
a) Plain cylindrical grinders  
b) Universal grinders  
c) Special grinders such as the centre less grinders.  

13. What are the uses of external grinders?  
External grinders are used for grinding cylindrical surfaces and to produce external cams eccentric and special form on the outside diameter of the work.  

14. List out the surfaces ground by the plain cylindrical grinder.  
External cylinders, tapers, fillets, undercuts and shoulders are some  
a) The head stock spindle may be used alive or dead.  
b) The headstock can be swiveled at an angle in horizontal plane.  
c) The wheel head and slide can be swiveled and traversed at any angle.  

15. What is Centre less grinding?  
Grinding the diameter of the work piece without mounting on Centers is known as Centre less grinding.  

16. What are the operations done in Centre less grinders?  
The various operations are:  
a) Through feed grinding  
b) In feed grinding  
c) End feed grinding  

17. What are the main disadvantages of Centre less grinding?  
The main disadvantages are:  
a) The hollow work cannot be grinded  
b) The work having multiple diameters is not easily handled.
18. How does the Centre less grinding operate?  (N-09, M-12)
The Centre less grinding operates with two wheels as the cutting or grinding wheel, to remove excess stock and a regulating wheel is used to control the speed of rotation of work and rate of feed.

19. Why is the Centre less grinders called specialized machine for cylindrical parts?  (M-10)
Centre less grinders are called specialized machine for cylindrical parts because it was developed form the rapid production of cylindrical, external taper, or external profile work.

20. What are the advantages of Centre less grinding?  (M-14)
The advantages of Centre less grinding are:

a) The work piece is suppressed through the operations.

b) No tendency for chatter or deflection of work

c) Easy control of the size of the work

d) No need of chucking or mounting.
1. Explain the working mechanism of cylindrical and surface grinding. (M-14)

2. a. Describe gear cutting by forming and shaping. (N-09, M-12)
    b. Give the specification of grinding wheel.

3. Explain the working principle and various methods of centreless grinding with a neat sketch. (N-09, M-12)

4. Sketch and explain the three methods of external cylindrical centreless grinding. (M-14)

5. What is meant dressing and truing of grinding wheel? (N-09, M-12)

6. Explain the abrasive jet grinding with diagram.

7. How do you classify cylindrical grinders? What is the difference between “Plain and universal cylindrical grinder”? (M-14)

8. a. Write short notes on gear shaping. (M-10)
    b. List the advantages and disadvantages of gear shaping process.

9. a. Describe Honing process. (M-10)
    b. Explain gear hobbing process over other gear generation processes.

10. a. Briefly discuss about the different types of abrasives used in a grinding wheel. (M-14)
    b. Describe the use of cutting fluids in grinding.
UNIT – V : CNC MACHINING

PART – A (2 Marks)

1. Define numerical control machine. (M-10)
   Numerical control can be defined as a form of programmable automation in which the process is controlled by numbers, letters and symbols.

2. List out any three basic components of NC system. (N-09, M-12)

3. Classify NC Motion Control System. (M-10)
   1. Point to point 2. Straight Cut 3. Contouring

4. Mention any three applications of Numerical control. (N-09, M-12)

5. What is NC part programming? (N-15)
   NC part programming is the procedure of by which the sequence of processing steps to be performed on the NC machine is planned and documented.

6. What is tape reader? (N-09, M-12)
   The tape reader feed the data from the tape to the buffer in blocks.

7. What are the functions in computer assisted part programming? (M-10)
   1. Defining the work part geometry, 2. Specifying the operation sequence and tool path.

8. What is APT language? (M-10)
   APT is not only a NC language it is also the computer program that performs the calculations to generate cutter positions based on APT statement.

9. Classify statements in APT. (N-15)

10. Define - Check surface (N-09, M-12)
    This is the surface that stops the movement of the tool in its current direction. In a sense, the forward movement of the tool.

11. Write down the general form of a Motion Statement. (N-09, M-12)
    Motion command/descriptive data example: GOTO/PI

12. Mention any four post processor statements in APT. (N-15)
    COOLNT, END, FEDRAT, MACHIN, RAPID

13. Write down any three Contouring Motion commands. (M-10)
    GOLFT GOFWD GOUP GORGT GOBACK
14. What are the merits of CAD/CAM in NC programming? (N-09, M-12)
   • Savings in geometry definition
   • Immediate visual verification
   • Use of automatic programming routine

15. What is CNC? (N-15)
   CNC is an NC system that utilizes a dedicated, stored program computer to perform some or all of the basic numerical control functions.

16. What are functions of CNC? (M-10)
   1. Machine tool Control
   2. In Process compensation
   3. Improved Programming and operating features

17. List out any three merits of CNC. (N-09, M-12)
   1. Part program tape and tape reader are used only once
   2. Tape editing at machine site
   3. Greater flexibility

18. What is FTP NC? (M-10)
   The objective of machine tool control system to move the cutting tool to a predefined location.

19. What do you mean by machining center? (M-10)
   The machining center in a control machines is an automatic tool changing arrangement that is designed to perform a variety of machining operations, with large number of cutting tools and provided with a continuous path CNC system.

20. Where is the common path contouring used? (N-09, M-12)
   Common path contouring is used in grinding machine and routes.
1. Define CNC and DNC. With a help of a diagram explain the working of NC machine tool.  

2. a. Narrate the design considerations of CNC machines.  
   b. Discuss about slide ways used in CNC machine tools.

3. a. List the difference between manual and computer assisted part programming.  
   b. Describe the drive systems used in CNC.

4. Explain the following in CNC machining.  
   a. Linear Interpolation  
   b. Circular Interpolation  
   c. Cubic interpolation

5. a. Explain the main difference between point to point and continuous path of numerically controlled machine tools.  
   b. Under what conditions of production the numerically controlled machine tools are employed.

6. a. With a neat sketch, explain the working of ATC?  
   b. Write short notes on APT language.

7. Explain the various elements of NC machine with closed loop control system.

8. Describe the spindle and feed drives. State the requirement of the drives of CNC machine tools.

9. a. List any five motions and control statements of computer assisted NC programming and explain.  
   b. Under what conditions of production the numerically controlled machine tools are employed