Set - A

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

Set - A

School of Manufacturing Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, III Semester,

End-Sem. Examination

Set - A

Course Code: SMS1301

Course Name: CNC Milling

Time: 2 Hour

Max. Marks: 50

Instructions:

1. Attempt all questions.
2. Section A contains 10 Questions. Each question carries 1 Mark.
3. Section B contains 04 Questions. Each question carries 4 Marks.
4. Section C contains 04 Questions. Each question carries 6 Marks.

Section – A

10X01 = 10 Marks

1. What does "D" represent in DCGT designation of indexable inserts?
   a) Wedge angle of 80 deg.
   b) Clearance angle 7 deg.
   c) Wedge angle of 55 deg.
   d) Wedge angle of 35 deg.
2. Sub-program calls with-
   a) G99
   b) M30
   c) M99
   d) M98
3. G02 is named as-
   a) Linear interpolation
   b) Circular Interpolation Anti-clockwise
   c) Circular Interpolation clockwise
   d) None of the above
4. Edge finder is used to-
   a) Cut the material
   b) Take the reference point in X and Y direction
   c) Take the reference point in the Z direction
   d) Take the reference point in X, Y and Z direction

5. **SKIP** the block in CNC ISO programming by using-
   a) &
   b) ?
   c) /
   d) %
6. M03 is used for _____.
   a) Clockwise Rotation
   b) Coolant ON
   c) Optional Stop
   d) Main Program End
7. G90 is named as-
   a) Absolute Coordinate
   b) Incremental Coordinate
   c) Feed in mm/rev
   d) Feed in mm/min
8. ATC stands for-
   a) Automatic Tool Control
   b) Automatic Tool Changer
   c) Automatic Turret Control
   d) None of the above
9. G94 is used for-
   a) Feed/revolution
   b) Feed/min
   c) Constant spindle speed
   d) None of the above
10. Rapid Traverse is given by-
    a) G00
    b) G01
    c) G02
    d) G03

Section – B

04X04 = 16 Marks

11. What do you understand by a Feedback system in CNC machines?
12. Define CNC and DNC.
13. Draw the block diagram of Open-loop system and Closed-loop system.
14. Define the following:
    a) Magnetic Tape Reader
    b) Punch Tape Reader

Section – C

04X06 = 24 Marks

15. Write down any six functions performed by MCU.
16. Define the following with neat and clean figure:
    a) Machine Zero Point.
    b) Tool Mount Reference Point
    c) Workpiece Zero Point
17. Write down any six differences between NC and CNC machines.
18. Explain the properties of CNC based on the motion type.

Set - A

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Manufacturing Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, III Semester,

End-Sem. Examination

Course Code: SMS1301 | **Time: 2 Hour**

Course Name: CNC Milling | **Max. Marks: 50**

Answer Key

Section – A

10X01 = 10 Marks

1. What does "D" represent in DCGT designation of indexable inserts?
   a) Wedge angle of 80 deg.
   b) Clearance angle 7 deg.
   c) Wedge angle of 55 deg.
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2. Sub-program calls with-
   a) G99
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   a) Linear interpolation
   b) Circular Interpolation Anti-clockwise
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   a) &
   b) ?
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6. M03 is used for _____.
   a) **Clockwise Rotation**
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   a) **Absolute Coordinate**
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   a) Automatic Tool Control
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   c) Automatic Turret Control
   d) None of the above
9. G94 is used for-
   a) Feed/revolution
   b) **Feed/min**
   c) Constant spindle speed
   d) None of the above
10. Rapid Traverse is given by-
   a) **G00**
   b) G01
   c) G02
   d) G03

Section – B

04X04 = 16 Marks

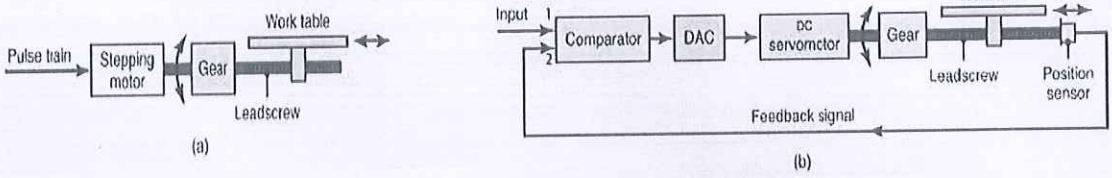
11. What do you understand by a Feedback system in CNC machines?

    Ans. This system consists of transducers that act as sensors. It is also called a measuring system. It contains position and speed transducers that continuously monitor the position and speed of the cutting tool located at any instant. The MCU receives the signals from these transducers and it uses the difference between the reference signals and feedback signals to generate the control signals for correcting the position and speed errors.

12. Define CNC and DNC.

    Ans. CNC means Computer Numerical Control. This means a computer converts the design produced by Computer-Aided Design software (CAD), into numbers. The numbers can be considered to be the coordinates of a graph and they control the movement of the cutter.
    Computer numerical control (CNC) is a method for automating control of machine tools through the use of software embedded in a microcomputer attached to the tool. It is commonly used in manufacturing for machining metal and plastic parts.
    With DNC controls, programs are managed for multiple NC machines by a central computer.

13. Draw the block diagram of Open-loop system and Closed-loop system.



14. Define the following:

a) Magnetic Tape Reader

Ans. Magnetic tape is a medium for magnetic recording, made of a thin, magnetizable coating on a long, narrow strip of plastic film. ... A device that stores computer data on magnetic tape is known as a tape drive. Magnetic tape revolutionized sound recording and reproduction and broadcasting.

b) Punch Tape Reader

Ans. Punch tape is used with some early computers as a means to store and input data into the computer. Instead of storing the data on individual cards punch tape stores data on rolls of paper containing punched holes representing the data being inputted or outputted.

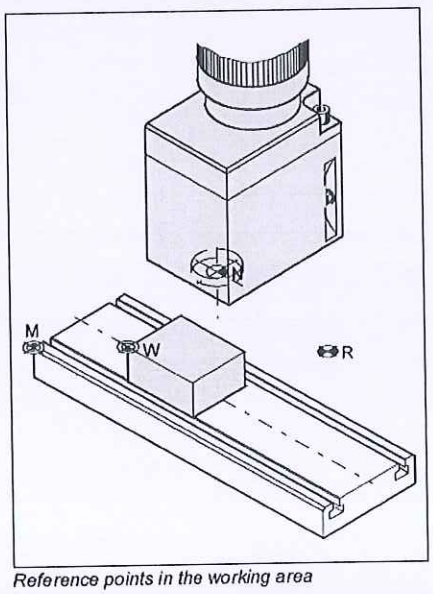
Section – C

04X06 = 24 Marks

15. Write down any six functions performed by MCU.

Ans. The various functions performed by MCU are:
It reads the coded instructions fed into it.
It decodes the coded instruction.
It implements interpolation (linear, circular and helical) to generate axis motion commands.
It feeds the axis motion commands to the amplifier circuits for driving the axis mechanisms.
It receives the feedback signals of position and speed for each drive axis.
It implements the auxiliary control functions such as coolant or spindle on/off and tool change

16. Define the following with neat and clean figure:



Reference points in the working area

Reference Points of the EMCO Milling Machines

M = Machine zero point
An unchangeable reference point established by the machine manufacturer.
Proceeding from this point the entire machine is measured.
At the same time "M" is the origin of the coordinate system.

R = Reference point
A position in the machine working area which is determined exactly by limit switches. The slide positions are reported to the control by the slides approaching the "R".
Required after every power failure.

N = Tool mount reference point
Starting point for the measurement of the tools. "N" lies at a suitable point on the tool holder system and is established by the machine manufacturer.

W = Workplece zero point
Starting point for the dimensions in the part program. Can be freely established by the programmer and moved as desired within the part program.

17. Write down any six differences between NC and CNC machines.

S.no	NC Machine	CNC Machine
1.	Here NC stands for Numerical Control	CNC stands for Computer Numerical Control.
2.	It is defined as the machine which is controlled by the set of instructions in the form of numbers, letters and symbols. The set of instructions is called as program.	It is defined as the machine which is used to control the motions of the workpiece and tool with the help of prepared program in computer. The program is written in alphanumeric data.
3.	In NC machine the programs are fed into the punch cards.	In CNC machine the programs are fed directly into the computer by a small key board similar to our traditional keyboard.
4.	Modification in the program is difficult.	Modification in the program is very easy.
5.	High skilled operator is required.	Less skilled operator is required.
6.	Cost of the machine is less.	Cost of the CNC machine is high.
7.	Maintenance cost is less	Maintenance cost is high.
8.	The programs in the NC machine cannot be stored.	In CNC machines, the programs can be stored in the computer and can be used again and again.
9.	It offers less flexibility and computational capability.	It offers additional flexibility and computational capability.
10.	The accuracy is less as compared with the CNC.	It has high accuracy.
11.	It requires more time for the execution of the job.	It takes very less time in the execution of the job.
12.	It is not possible to run it continuously.	It can be run continuously for 24 hours of a day.

18. Explain the properties of CNC based on the motion type.

Point To Point Tool Movement:

- Point to point control systems cause the tool to move to a point on the part and execute an operation at that point only.
- The tool is not in continuous contact with the part while it is moving.
- Examples: drilling, reaming, punching, boring and tapping.

Continuous Path Tool Movement:

- Continuous path controllers cause the tool to maintain continuous contact with the part as the tool cuts a contour shape.
- These operations include milling along any lines at any angle, milling arcs and lathe turning.

set-B

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Manufacturing Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, III Semester,

End-Sem. Examination

Set- B

Course Code: SMS1301 **Time: 2 Hour**

Course Name: CNC Milling **Max. Marks: 50**

Instructions:

1. Attempt all questions.
2. Section A contains 10 Questions. Each question carries 1 Mark.
3. Section B contains 04 Questions. Each question carries 4 Marks.
4. Section C contains 04 Questions. Each question carries 6 Marks.

Section – A

10X01 = 10 Marks

1. What does "C" represent in CCGT designation of indexable inserts?
   a) Wedge angle of 80 deg.
   b) Clearance angle 7 deg.
   c) Wedge angle of 55 deg.
   d) Wedge angle of 35 deg.
2. Sub-program ends with-
   a) G99
   b) M30
   c) M99
   d) M98
3. G01 is named as-
   a) Linear interpolation
   b) Circular Interpolation Anti-clockwise
   c) Circular Interpolation clockwise
   d) None of the above
4. Touch Probe is used to-
   a) Cut the material
   b) Take the reference point in X and Y direction
   c) Take the reference point in the Z direction
   d) Take the reference point in X, Y and Z direction

5. **SKIP** the block in CNC ISO programming by using-
   a) &
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6. M04 is used for _____.
   a) Clockwise Rotation
   b) Coolant ON
   c) Anticlockwise Rotation
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7. G91 is named as-
   a) Absolute Coordinate
   b) Incremental Coordinate
   c) Feed in mm/rev
   d) Feed in mm/min
8. ATC stands for-
   a) Automatic Tool Control
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9. G94 is used for-
   a) Feed/revolution
   b) Feed/min
   c) Constant spindle speed
   d) None of the above
10. Rapid Traverse is given by-
    a) G00
    b) G01
    c) G02
    d) G03

Section – B

04X04 = 16 Marks

11. What do you understand by G-codes and M-codes?
12. Define CNC and DNC.
13. Draw the block diagram of Open-loop system and Closed-loop system.
14. Define the following:
    a) Magnetic Tape Reader
    b) Punch Tape Reader

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Section – C

04X06 = 24 Marks

15. Write down any six functions performed by MCU.
16. Define the following with neat and clean figure:
    a) Machine Zero Point.
    b) Tool Mount Reference Point
    c) Workpiece Zero Point
17. Write down any six differences between NC and CNC machines.
18. Describe all the six elements of CNC.

Set - B

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Manufacturing Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, III Semester,

End-Sem. Examination

Course Code: SMS1301

Course Name: CNC Milling

Time: 2 Hour

Max. Marks: 50

Answer Key

Section – A

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6. M04 is used for _____.
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10. Rapid Traverse is given by-
   a) G00
   b) G01
   c) G02
   d) G03

Section – B

04X04 = 16 Marks

11. What do you understand by G-codes and M-codes?

    Ans. G codes: A G code in CNC programming controls the movements of a machine, dictating how and where a machine should move to fabricate a part.
    M codes: An M code in CNC programming controls miscellaneous machine functions, including starting and stopping specific actions or programs.

12. Define CNC and DNC.

    Ans. CNC means Computer Numerical Control. This means a computer converts the design produced by Computer-Aided Design software (CAD), into numbers. The numbers can be considered to be the coordinates of a graph and they control the movement of the cutter.
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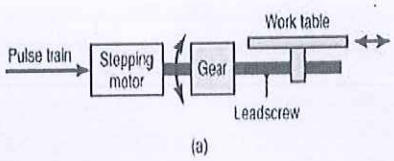
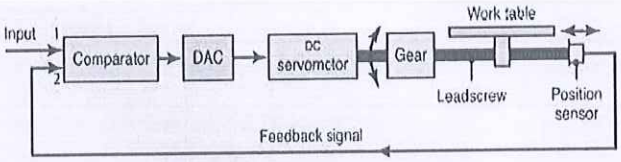


(a)



(b)

14. Define the following:

a) Magnetic Tape Reader

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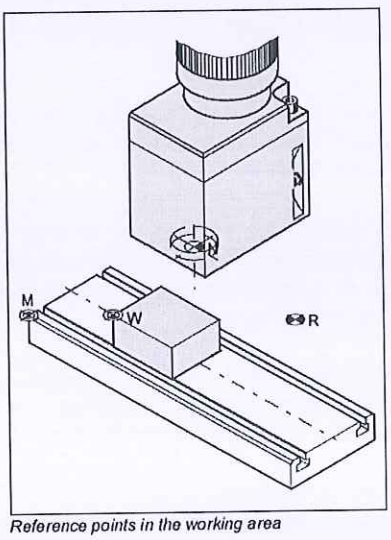
Section – C

04X06 = 24 Marks

15. Write down any six functions performed by MCU.

Ans. The various functions performed by MCU are:
It reads the coded instructions fed into it.
It decodes the coded instruction.
It implements interpolation (linear, circular and helical) to generate axis motion commands.
It feeds the axis motion commands to the amplifier circuits for driving the axis mechanisms.
It receives the feedback signals of position and speed for each drive axis.
It implements the auxiliary control functions such as coolant or spindle on/off and tool change

16. Define the following with neat and clean figure:



Reference points in the working area

Reference Points of the EMCO Milling Machines

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At the same time "M" is the origin of the coordinate system.

R = Reference point
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Required after every power failure.

N = Tool mount reference point
Starting point for the measurement of the tools. "N" lies at a suitable point on the tool holder system and is established by the machine manufacturer.

W = Workpiece zero point
Starting point for the dimensions in the part program. Can be freely established by the programmer and moved as desired within the part program.

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4.	Modification in the program is difficult.	Modification in the program is very easy.
5.	High skilled operator is required.	Less skilled operator is required.
6.	Cost of the machine is less.	Cost of the CNC machine is high.
7.	Maintenance cost is less	Maintenance cost is high.
8.	The programs in the NC machine cannot be stored.	In CNC machines, the programs can be stored in the computer and can be used again and again.
9.	It offers less flexibility and computational capability.	It offers additional flexibility and computational capability.
10.	The accuracy is less as compared with the CNC.	It has high accuracy.
11.	It requires more time for the execution of the job.	It takes very less time in the execution of the job.
12.	It is not possible to run it continuously.	It can be run continuously for 24 hours of a day.

18. Describe all the six elements of CNC.

Ans.

- ***Input devices:***

These are the devices which are used to input the part program in the CNC machine. There are three commonly used input devices and these are punch tape reader, magnetic tape reader and computer via RS-232-C communication.

- ***Machine Control unit:***

  It is the heart of the CNC machine. It performs all the controlling action of the CNC machine. The various functions performed by MCU are:

  - It reads the coded instructions fed into it.
  - It decodes the coded instruction.
  - It implements interpolation (linear, circular and helical) to generate axis motion commands.
  - It feeds the axis motion commands to the amplifier circuits for driving the axis mechanisms.
  - It receives the feedback signals of position and speed for each drive axis.
  - It implements the auxiliary control functions such as coolant or spindle on/off and tool change.

- ***Machine Tool:***

  A CNC machine tool always has a sliding table and a spindle to control the position and speed. The machine table is controlled in X and Y-axis direction and the spindle is controlled in the Z-axis direction.

- ***Driving System:***

  The driving system of a CNC machine consists of amplifier circuits, drive motors and ball lead screw. The MCU feeds the signals (i.e. of position and speed) of each axis to the amplifier circuits. The control signals are then augmented (increased) to actuate the drive motors. And the actuated drive motors rotate the ball lead screw to position the machine table.

- Spindle drive:

The main spindle drive is usually a variable speed AC motor with a frequency converter. The speed is measured by a tacho generator. This produces an output voltage as a measure of the rotational speed. This actual speed is compared with the target speed in the CNC control and the motor is adjusted if necessary.

- Feed drive:

The feed drive is usually provided via variable speed DC motors. A clutch with overload protection between the drive motor and ball screw to reduce the possibility of damage in the event of a collision.

- ***Feedback system:***

This system consists of transducers that act as sensors. It is also called a measuring system. It contains position and speed transducers that continuously monitor the position and speed of the cutting tool located at any instant. The MCU receives the signals from these transducers and it uses the difference between the reference signals and feedback signals to generate the control signals for correcting the position and speed errors.

- ***Display Unit:***

A monitor is used to display the programs, commands and other useful data of CNC machine.

set-A

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Manufacturing Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, III Semester,

End-Sem. Examination

Set A

Course Code: SMS1302 | **Time: 2 Hour**

Course Name: CNC Turning | **Max. Marks: 50**

Instructions:

1. Attempt all questions.
2. Section A contains 10 Questions. Each question carries 1 Mark.
3. Section B contains 04 Questions. Each question carries 4 Marks.
4. Section C contains 04 Questions. Each question carries 6 Marks.

Section – A

10X01 = 10 Marks

1. G97 is named as-
   a) Constant Cutting Speed
   b) Constant Spindle speed
   c) Spindle rotation Clockwise
   d) Speed limit
2. M09 is named as-
   a) Coolant ON
   b) Coolant OFF
   c) Program End
   d) Optional Stop
3. M08 is named as-
   a) Coolant ON
   b) Coolant OFF
   c) Program End
   d) Optional Stop
4. Programs are executed in-
   a) Edit mode
   b) Memory mode
   c) MDI mode
   d) All of the above

5. What is the code for Dwell time?
   a) G15
   b) G17
   c) G04
   d) G03
6. Key used to end the block in program is-
   a) POS
   b) PROG
   c) EOB
   d) RESET
7. Tool mount reference point is denoted by-
   a) M
   b) W
   c) R
   d) N
8. M03 is named as-
   a) Tool rotation Clockwise
   b) Tool Rotation Anti Clockwise
   c) Spindle Rotation Clockwise
   d) Spindle Rotation Anti Clockwise
9. What is the unit of Cutting Velocity?
   a) mm/min
   b) mm/rev
   c) m/min
   d) None of the above
10. New programs are prepared in-
    a) Edit mode
    b) Memory mode
    c) MDI mode
    d) All of the above

Section – B

04X04 = 16 Marks

11. Explain the threading cycle with all its parameters.
12. What do you understand by Service Life Monitoring?
13. Write down the difference between Machine coordinates and Absolute coordinates with the help of a diagram.
14. Explain the difference between G73 cycle and G74 cycle.

Section – C

04X06 = 24 Marks

15. What are the Tool movement and Spindle rotation for Right Hand and Left-Hand Threads? Also, calculate all the parameters for M20 threads.
16. Draw the block diagram of the Transport System in the automated manufacturing system.
17. Explain the Flexible Manufacturing Cell.
18. Describe Grooving cycle with all the parameters.

Set - A

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Manufacturing Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, III Semester,

End-Sem. Examination

Course Code: SMS1302

Course Name: CNC Turning

Time: 2 Hour

Max. Marks: 50

Answer Key

Section – A

10X01 = 10 Marks

1. G97 is named as-
   a) Constant Cutting Speed
   b) Constant Spindle speed
   c) Spindle rotation Clockwise
   d) Speed limit
2. M09 is named as-
   a) Coolant ON
   b) Coolant OFF
   c) Program End
   d) Optional Stop
3. M08 is named as-
   a) Coolant ON
   b) Coolant OFF
   c) Program End
   d) Optional Stop
4. Programs are executed in-
   a) Edit mode
   b) Memory mode
   c) MDI mode
   d) All of the above
5. What is the code for Dwell time?
   a) G15
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   c) G04
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6. Key used to end the block in program is-
   a) POS
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   c) EOB
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9. What is the unit of Cutting Velocity?
   a) mm/min
   b) mm/rev
   c) m/min
   d) None of the above
10. New programs are prepared in-
    a) Edit mode
    b) Memory mode
    c) MDI mode
    d) All of the above

Section – B

04X04 = 16 Marks

11. Explain the threading cycle with all its parameters.

G78 Multiple Threading Cycle

Format
N... G78 P_1... Q_1... R_1...
N... G78 X(U)... Z(W)... R_2... P_2... Q_2... F...

first block:

P_1 ..... is a 6 digit parameter divided in digit couples:

PXXxxxx → The first two digits of this parameter define the number of finishing cuts

PxxXXxx → The next two digits define the chamfer value P_F (see drawing)

$$P_{xxXxxx} = \frac{P_F\,[mm] \times 10}{F}$$

PxxxxXX → Defines the flank angle of thread in [°] (allowed: 0,29,30,56,60,80)

Q_1 ..... Minimum cutting depth [µm] incremental

R_1 ..... Finishing offset [mm] incremental

second block X(U), Z(W) Absolute (incremental) coordinates of the point K

R_2 [mm] Incremental taper value with sign (R=0 cylindrical thread)

P_2 [µm] Thread depth (always positive), in the drawing shown as P_2

Q_2 [µm] Cutting depth of the first cut (radius value) without sign

F [mm] Thread pitch

12. What do you understand by Service Life Monitoring?

Ans. With **service life monitoring** all tools operating times are recorded by the machine control and compared with the target service life. The remaining tool service life is displayed on the screen and must be longer than the duration of the next tool operation.

13. Write down the difference between Machine coordinates and Absolute coordinates with the help of a diagram.

Ans. Machine coordinates – Machine coordinates shows the distance between the machine zero point and turret zero point.

Absolute coordinates – Absolute coordinates shows the distance between the workpiece zero point and turret zero point.

14. Explain the difference between G73 cycle and G74 cycle.

Ans. G73 cycle is Contour Turning cycle.

Syntax:

- G73 U R;
  G73 P Q U W F;
- BLOCK 1:
  - W (mm) = depth of cut in X direction (incremental) without sign.
  - R (mm) = retract in X direction (diametrically) and Z direction
- BLOCK 2:
  - P = block number of the first block for the profile.
  - Q = block number of the last block for the profile.
  - U (mm) = finishing allowance in X direction.
  - W (mm) = finishing allowance in Z direction.

F = feed (mm/rev).

G74 cycle is Facing cycle.

Syntax:

- G74 W R;
  G74 P Q U W F;
- BLOCK 1:
  - W (mm) = depth of cut in Z direction (incremental) without sign.
  - R (mm) = retract in X direction (diametrically) and Z direction
- BLOCK 2:
  - P = block number of the first block for the profile.
  - Q = block number of the last block for the profile.
  - U (mm) = finishing allowance in X direction.
  - W (mm) = finishing allowance in Z direction.

F = feed (mm/rev).

Section – C

04X06 = 24 Marks

15. What are the Tool movement and Spindle rotation for Right Hand and Left-Hand Threads? Also, calculate all the parameters for M20 threads.

Ans. For Right-Hand Threads:

Spindle Rotation is Clockwise and Tool movement is towards the Chuck.

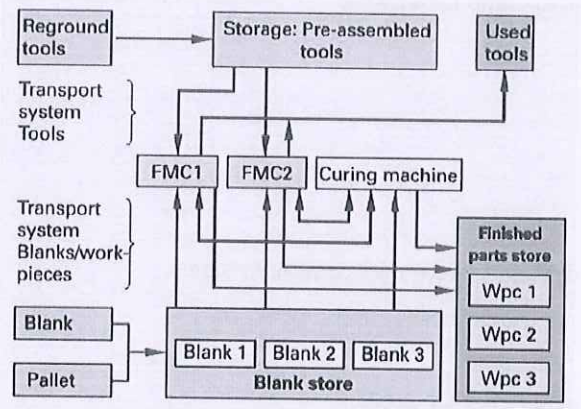
Spindle Rotation is Anti Clockwise and Tool movement is away from the Chuck.

For Left Hand Threads:

Spindle Rotation is Clockwise and Tool movement is away from the Chuck.

Spindle Rotation is Anti Clockwise and Tool movement is towards the Chuck.

16. Draw the block diagram of the Transport System in the automated manufacturing system.



17. Explain the Flexible Manufacturing Cell.

Ans. A flexible manufacturing cell is created if, for example, a machining centre with a workpiece magazine and an overhead loading robot are connected to form a unit.
The magazine system supplies the machine tool with blanks and receives the finished workpieces over, for example, an 8-hour shift.
Besides individual machines, two identical machines are often used as a flexible manufacturing cell for medium batch sizes.

18. Describe Grooving cycle with all the parameters.

G77 Cut-in Cycle (X Axis)

Format

N... G77 R_1...
N... G77 X(U)... Z(W)... P... Q... R_2... F...

first block	R_1 [mm]	Retraction height for chip breaking, in the drawing shown as R_1
sec. block	X(U), Z(W)	Absolute (incremental) coordinates of K
	P [µm]	Cutting depth in X direction (no sign)
	Q [µm]	Incremental infeed in Z direction (no sign)
	R	Undercut at X end point, in the drawing shown as R_2
	F	Feed

Note

- The infeed Q must be smaller than tool width B.
- Tool width will not be taken into consideration with this cycle.
- With the first cut no undercut will be executed.
- The undercut must be a positive value.

set-B

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

Set-B

School of Manufacturing Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, III Semester,

End-Sem. Examination

Set-B

Course Code: SMS1302

Course Name: CNC Turning

Time: 2 Hour

Max. Marks: 50

Instructions:

1. Attempt all questions.
2. Section A contains 10 Questions. Each question carries 1 Mark.
3. Section B contains 04 Questions. Each question carries 4 Marks.
4. Section C contains 04 Questions. Each question carries 6 Marks.

Section – A

10X01 = 10 Marks

1. G92 is named as-
   a) Constant Cutting Speed
   b) Constant Spindle speed
   c) Spindle rotation Clockwise
   d) Spindle Speed limit
2. M08 is named as-
   a) Coolant ON
   b) Coolant OFF
   c) Program End
   d) Optional Stop
3. M01 is named as-
   a) Coolant ON
   b) Coolant OFF
   c) Program End
   d) Optional Stop
4. Programs are executed in-
   a) Edit mode
   b) Memory mode
   c) MDI mode
   d) All of the above

5. What is the code for Dwell time?
   a) G15
   b) G17
   c) G04
   d) G03
6. Key used to end the block in program is-
   a) POS
   b) PROG
   c) EOB
   d) RESET
7. Tool mount reference point is denoted by-
   a) M
   b) W
   c) R
   d) N
8. M03 is named as-
   a) Tool rotation Clockwise
   b) Tool Rotation Anti Clockwise
   c) Spindle Rotation Clockwise
   d) Spindle Rotation Anti Clockwise
9. What is the unit of Cutting Velocity?
   a) mm/min
   b) mm/rev
   c) m/min
   d) None of the above
10. New programs are prepared in-
    a) Edit mode
    b) Memory mode
    c) MDI mode
    d) All of the above

Section – B

04X04 = 16 Marks

11. Explain the grooving cycle with all its parameters.
12. What do you understand by Service Life Monitoring?
13. Write down the difference between Machine coordinates and Absolute coordinates with the help of a diagram.
14. Explain the G74 cycle with all its parameters.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Section – C

04X06 = 24 Marks

15. What are the Tool movement and Spindle rotation for Right Hand and Left-Hand Threads? Also, calculate all the parameters for M16 threads.
16. Draw the block diagram of the Transport System in the automated manufacturing system.
17. Explain the Flexible Manufacturing Cell.
18. Describe the threading cycle with all the parameters.

Set-B

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Manufacturing Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, III Semester,

End-Sem. Examination

Course Code: SMS1302

Course Name: CNC Turning

Time: 2 Hour

Max. Marks: 50

Answer Key

Section – A

10X01 = 10 Marks

1. G92 is named as-
   a) Constant Cutting Speed
   b) Constant Spindle speed
   c) Spindle rotation Clockwise
   d) Spindle Speed limit
2. M08 is named as-
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   a) Coolant ON
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9. What is the unit of Cutting Velocity?
   a) mm/min
   b) mm/rev
   c) m/min
   d) None of the above
10. New programs are prepared in-
    a) Edit mode
    b) Memory mode
    c) MDI mode
    d) All of the above

Section – B

04X04 = 16 Marks

11. Explain the grooving cycle with all its parameters.

G77 Cut-in Cycle (X Axis)

Format

N... G77 R_1...
N... G77 X(U)... Z(W)... P... Q... R_2... F...

first block	R_1 [mm]	Retraction height for chip breaking, in the drawing shown as R_1
sec. block	X(U), Z(W)	Absolute (incremental) coordinates of K
	P [µm]	Cutting depth in X direction (no sign)
	Q [µm]	Incremental infeed in Z direction (no sign)
	R	Undercut at X end point, in the drawing shown as R_2
	F	Feed

Note

- The infeed Q must be smaller than tool width B.
- Tool width will not be taken into consideration with this cycle.
- With the first cut no undercut will be executed.
- The undercut must be a positive value.

12. What do you understand by Service Life Monitoring?

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14. Explain the G74 cycle with all its parameters.

G74 cycle is Facing cycle.

Syntax:

- G74 W R;
  G74 P Q U W F;
- BLOCK 1:
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  - R (mm) = retract in X direction (diametrically) and Z direction
- BLOCK 2:
  - P = block number of the first block for the profile.
  - Q = block number of the last block for the profile.
  - U (mm) = finishing allowance in X direction.
  - W (mm) = finishing allowance in Z direction.

F = feed (mm/rev).

Section – C

04X06 = 24 Marks

15. What are the Tool movement and Spindle rotation for Right Hand and Left-Hand Threads? Also, calculate all the parameters for M16 threads.

Ans. For Right-Hand Threads:

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Spindle Rotation is Anti Clockwise and Tool movement is away from the Chuck.

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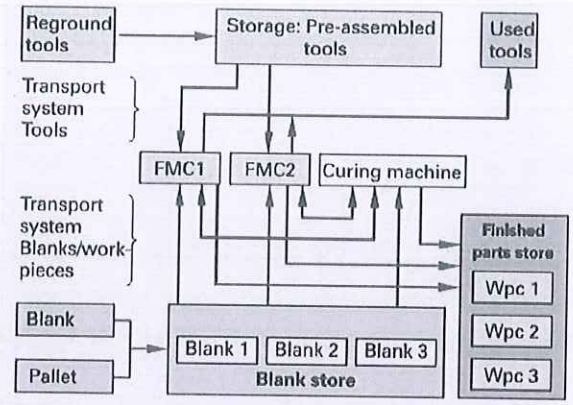
16. Draw the block diagram of the Transport System in the automated manufacturing system.



17. Explain the Flexible Manufacturing Cell.

Ans. A flexible manufacturing cell is created if, for example, a machining centre with a workpiece magazine and an overhead loading robot are connected to form a unit.
The magazine system supplies the machine tool with blanks and receives the finished workpieces over, for example, an 8-hour shift.
Besides individual machines, two identical machines are often used as a flexible manufacturing cell for medium batch sizes.

18. Describe the threading cycle with all the parameters.

G78 Multiple Threading Cycle

Format
N... G78 P_1... Q_1... R_1...
N... G78 X(U)... Z(W)... R_2... P_2... Q_2... F...

first block:

P_1 ..... is a 6 digit parameter divided in digit couples:

PXXxxxx → The first two digits of this parameter define the number of finishing cuts

PxxXXxx → The next two digits define the chamfer value P_F (see drawing)

$$P_{xxxxxx} = \frac{P_F\,[mm] \times 10}{F}$$

PxxxxXX → Defines the flank angle of thread in [°] (allowed: 0,29,30,56,60,80)

Q_1 ..... Minimum cutting depth [µm] incremental

R_1 ..... Finishing offset [mm] incremental

second block X(U), Z(W) Absolute (incremental) coordinates of the point K

R_2 [mm] Incremental taper value with sign (R=0 cylindrical thread)

P_2 [µm] Thread depth (always positive), in the drawing shown as P_2

Q_2 [µm] Cutting depth of the first cut (radius value) without sign

F [mm] Thread pitch

Set - A

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Manufacturing Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, III Semester,

End-Sem. Examination

Set - A

Course Code: SMS1303 **Time: 2 Hour**

Course Name: Advanced Conventional Machining **Max. Marks: 50**

Instructions:

1. Attempt all questions.
2. Section A contains 10 Questions. Each question carries 1 Mark.
3. Section B contains 04 Questions. Each question carries 4 Marks.
4. Section C contains 04 Questions. Each question carries 6 Marks.

Section – A

10X01 = 10 Marks

1. Full form of HSS.
   a) High stainless steel
   b) High strength steel
   c) High-speed steel
   d) High shine steel
2. Cutters should have _____ stiffness and toughness if they are to have the longest possible life.
   a) Low
   b) High
   c) Moderate
   d) Neutral
3. ..... clamps are arranged so that the tool is unobstructed when machining.
   a) Toggle
   b) Flat
   c) Step
   d) Round
4. ..... clamps are self-locking once the joints are aligned.
   a) Toggle
   b) Flat
   c) Step
   d) Round

5. A drill bit angle of _____ is used for long chip light metals.
   a) 130°
   b) 140°
   c) 90°
   d) 45°
6. M denotes for which material.
   a) Stainless steel
   b) Carbide
   c) Heat resistant alloy
   d) Non-ferrous material
7. Formulae for feed rate is
   a) $F_r = f_z \times Z \times N$
   b) $F_r = f_z \times N$
   c) $F_r = f_z \times Z$
   d) None of the above
8. When using clamps, the clamping bolt should be positioned as close as possible to the .....
   a) Tool
   b) Bed
   c) Workpiece
   d) Machine
9. Swivel clamps enables the workpiece to be inserted from the .....
   a) Side
   b) Bottom
   c) Top
   d) Bottom-Left
10. Hydraulic clamping systems consist of
    a) A pressure generator
    b) Control valves
    c) Clamping cylinders
    d) All of the above

Section – B

04X04 = 16 Marks

11. What are the advantages of the use of clamping fixtures in machining?
12. Why is the cutting speed when using HSS lower than that with CC?
13. Explain the principle of toggle lever clamp.
14. Under what circumstances are swivel cylinders are used for clamping?

Section – C

04X06 = 24 Marks

15. Explain-
    a. Stiffness
    b. Toughness
    c. Hardness
16. Write short notes on-
    a. HSS
    b. Carbide
    c. Cermet
17. Why does clamping with electric permanent magnet chucks enable particularly high machining accuracy?
18. Describe modular systems with their types.

Set - A

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Manufacturing Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, III Semester,

End-Sem. Examination

Course Code: SMS1303 **Time: 2 Hour**

Course Name: Advanced Conventional Machining **Max. Marks: 50**

Answer Key

Section – A

10X01 = 10 Marks

1. Full form of HSS.
   - **a) High stainless steel**
   - b) High strength steel
   - c) High-speed steel
   - d) High shine steel
2. Cutters should have _____ stiffness and toughness if they are to have the longest possible life.
   - a) Low
   - **b) High**
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   - d) Neutral
3. ..... clamps are arranged so that the tool is unobstructed when machining.
   - a) Toggle
   - **b) Flat**
   - c) Step
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4. ..... clamps are self-locking once the joints are aligned.
   - **a) Toggle**
   - b) Flat
   - c) Step
   - d) Round
5. A drill bit angle of _____ is used for long chip light metals.
   - a) 130°
   - **b) 140°**
   - c) 90°
   - d) 45°

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   a) **Stainless steel**
   b) Carbide
   c) Heat resistant alloy
   d) Non-ferrous material
7. Formulae for feed rate is
   a) **$F_r = f_z \times Z \times N$**
   b) $F_r = f_z \times N$
   c) $F_r = f_z \times Z$
   d) None of the above
8. When using clamps, the clamping bolt should be positioned as close as possible to the .....
   a) Tool
   b) Bed
   c) **Workpiece**
   d) Machine
9. Swivel clamps enables the workpiece to be inserted from the .....
   a) Side
   b) Bottom
   c) **Top**
   d) Bottom-Left
10. Hydraulic clamping systems consist of
    a) A pressure generator
    b) Control valves
    c) Clamping cylinders
    d) **All of the above**

Section – B

04X04 = 16 Marks

11. What are the advantages of the use of clamping fixtures in machining?

Ans. –elimination of non-value work such as marking and centre punching.
- many workpieces cannot be machined without a clamping fixture.
- reduced manufacturing time
- improved repeatability
- reduced set-up time for aligning and clamping.

12. Why is the cutting speed when using HSS lower than that with CC?

Ans. cutting speed of HSS is lower than CC because HSS has the highest toughness but also the lowest hardness of all the various cutting material whereas in CC, the smaller the subscripts, the higher the wear resistance of the carbide is and it has higher level of toughness and are therefore more suitable for higher cutting speed.

13. Explain the principle of toggle lever clamp.

Ans. a clamping element using the toggle principle generates its greatest clamping force when the three joints A, B, C are aligned. From this position it is no longer possible for the toggle lever to be pushed back by a reaction force. Once the clamp moves past this extended position a safe clamping condition is guaranteed. The clamp is self-locking.

14. Under what circumstances are swivel cylinders are used for clamping?

Ans. swivel clamps enable the workpiece to be inserted from the top. Part of the total stroke is used to rotate the piston and with it the clamping claw when clamping and unclamping. The workpiece is clamped in the final part of the stroke.

Swing clamps are used where the clamping points must be clear during insertion and removing of the workpiece.

Section – C

04X06 = 24 Marks

15. Explain
    a) Stiffness
    b) Toughness
    c) Hardness

Ans.

a) Stiffness

Ans.: ability to withstand bulk deformation

b) Toughness

Ans.: ability to withstand shocks without damage

c) Hardness

Ans.: ability of a material surface to withstand locals deformation

16. Write short notes on
    a) HSS
    b) Carbide
    c) Cermet

Ans.

a) HSS

Ans. It contains tungsten, molybdenum, vanadium and cobalt as its main alloy elements. It has highest toughness and lowest hardness of all the various cutting materials.

b) Carbide

Ans. it is composite material which is manufactured by sintering raw materials in powder form. During this hard tungsten carbide is bonded with the softer binder material of cobalt.

c) Cermet

`Ans. Carbide on the basis of titanium carbide instead of tungsten carbide and using nickel or cobalt as a binder are known as cermet (Ceramic – metal).

17. Why does clamping with electric permanent magnet chucks enable particularly high machining accuracy?

Ans. electro-permanent magnet chucks use a short electrical pulse to switch between clamped and unclamped and vice versa. The clamping is generated by magnetizing permanent magnet cores using the magnetic field of an electric coil. The workpiece is held by the permanent magnets during machining. The plate is not supplied with power and does not warm up. The result is high machining accuracy.

18. Describe modular systems with its types.

Ans. modular fixture systems consist of matching, interlocking elements. These individual components consisting of a base plate with bracket, structural, positioning, support, clamping and connecting elements, can be assembled into a fixture using separable joints. They are particularly suited to flexible manufacturing.

Modular fixture systems are divided into **T-slot and key systems** and **hole systems**.

With the **T-slot and key systems** the base plate the individual modules are provided with T-slots. The modules are joined together with sliding keys which are inserted into the T-slots.

This creates a positive connection both transversely and perpendicularly to the axis of the T-slot. When assembling the fixture the sections can be moved to any position along the length of the T-slot. This enables a good match to the geometry of the workpiece and unlimited adjustment.

The **hole system** uses dowel pins and screws to connect the individual models.

The mating holes in the base plate are located either above the threaded holes or adjacent to threaded holes.

Set-B

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Manufacturing Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, III Semester,

End-Sem. Examination

Set-B

Course Code: SMS1303 **Time: 2 Hour**

Course Name: Advanced Conventional Machining **Max. Marks: 50**

Instructions:

1. Attempt all questions.
2. Section A contains 10 Questions. Each question carries 1 Mark.
3. Section B contains 04 Questions. Each question carries 4 Marks.
4. Section C contains 04 Questions. Each question carries 6 Marks.

Section – A

10X01 = 10 Marks

1. Full form of HSS.
   a) High stainless steel
   b) High strength steel
   c) High-speed steel
   d) High shine steel
2. Cutters should have _____ stiffness and toughness if they are to have the longest possible life.
   a) Low
   b) High
   c) Moderate
   d) Neutral
3. ..... clamps are arranged so that the tool is unobstructed when machining.
   a) Toggle
   b) Flat
   c) Step
   d) Round
4. ..... clamps are self-locking once the joints are aligned.
   a) Toggle
   b) Flat
   c) Step
   d) Round

5. A drill bit angle of _____ is used for long chip light metals.
   a) 130°
   b) 140°
   c) 90°
   d) 45°
6. M denotes for which material.
   a) Stainless steel
   b) Carbide
   c) Heat resistant alloy
   d) Non-ferrous material
7. K denotes for which material.
   a) Cast iron
   b) Stainless steel
   c) Heat resistant alloy
   d) Krypton an
8. Carbide is classified into main groups P,M & K.
   a) True
   b) False
9. The hole system uses .....& screws to connect the individual modules.
   a) Dowels
   b) Taper cross
   c) Washers
   d) None of the above
10. Modular fixture systems are suitable for ..... & medium-sized batch production on CNC.
    a) Large
    b) Small
    c) Oval
    d) Shaper

Section – B

04X04 = 16 Marks

11. Write the tasks of cutting material coatings.
12. Why is the cutting speed when using HSS lower than that with CC?
13. Explain the principle of toggle lever clamp.
14. Under what circumstances are swivel cylinders are used for clamping?

Section – C

04X06 = 24 Marks

15. Explain-
    a. Stiffness
    b. Toughness
    c. Hardness
16. Write short notes on-
    a. HSS
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17. Why does clamping with electric permanent magnet chucks enable particularly high machining accuracy?
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Set-B

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Manufacturing Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, III Semester,

End-Sem. Examination

Course Code: SMS1303 | **Time: 2 Hour**

Course Name: Advanced Conventional Machining | **Max. Marks: 50**

Answer Key

Section – A

10X01 = 10 Marks

1. Full form of HSS.
   - **a) High stainless steel**
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2. Cutters should have _____ stiffness and toughness if they are to have the longest possible life.
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6. M denotes for which material.
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10. Modular fixture systems are suitable for ..... & medium-sized batch production on CNC.
   a) Large
   b) **Small**
   c) Oval
   d) Shaper

Section – B

04X04 = 16 Marks

11. Write the tasks of cutting material coatings.

Ans. the tasks of cutting material coatings are:

1) Increasing the wear resistance
2) Prevention of oxidization and diffusion
3) Heat barrier to the HSS or CC base material
4) Prevention of built-up edge formation.

12. Why is the cutting speed when using HSS lower than that with CC?

Ans. cutting speed of HSS is lower than CC because HSS has the highest toughness but also the lowest hardness of all the various cutting material whereas in CC, the smaller the subscripts, the higher the wear resistance of the carbide is and it has higher level of toughness and are therefore more suitable for higher cutting speed.

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Ans. a clamping element using the toggle principle generates its greatest clamping force when the three joints A, B, C are aligned. From this position it is no longer possible for the toggle lever to be

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Swing clamps are used where the clamping points must be clear during insertion and removing of the workpiece.

Section – C

04X06 = 24 Marks

15. Explain
    a) Stiffness
    b) Toughness
    c) Hardness

Ans.

a) Stiffness

Ans.: ability to withstand bulk deformation

b) Toughness

Ans.: ability to withstand shocks without damage

c) Hardness

Ans.: ability of a material surface to withstand locals deformation

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Ans.

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b) Carbide

Ans. it is composite material which is manufactured by sintering raw materials in powder form. During this hard tungsten carbide is bonded with the softer binder material of cobalt.

c) Cermet

`Ans. Carbide on the basis of titanium carbide instead of tungsten carbide and using nickel or cobalt as a binder are known as cermet (Ceramic – metal).

17. Why does clamping with electric permanent magnet chucks enable particularly high machining accuracy?

Ans. electro-permanent magnet chucks use a short electrical pulse to switch between clamped and unclamped and vice versa. The clamping is generated by magnetizing permanent magnet cores

using the magnetic field of an electric coil. The workpiece is held by the permanent magnets during machining. The plate is not supplied with power and does not warm up. The result is high machining accuracy.

18. Describe modular systems with its types.

Ans. modular fixture systems consist of matching, interlocking elements. These individual components consisting of a base plate with bracket, structural, positioning, support, clamping and connecting elements, can be assembled into a fixture using separable joints. They are particularly suited to flexible manufacturing.

Modular fixture systems are divided into **T-slot and key systems** and **hole systems**.

With the **T-slot and key systems** the base plate the individual modules are provided with T-slots. The modules are joined together with sliding keys which are inserted into the T-slots.

This creates a positive connection both transversely and perpendicularly to the axis of the T-slot. When assembling the fixture the sections can be moved to any position along the length of the T-slot. This enables a good match to the geometry of the workpiece and unlimited adjustment.

The **hole system** uses dowel pins and screws to connect the individual models.

The mating holes in the base plate are located either above the threaded holes or adjacent to threaded holes.

Set-A

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Manufacturing Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, III Semester,

End-Sem. Examination

Set-A

Course Code: SMS1304 **Time: 2 Hour**

Course Name: Pneumatics **Max. Marks: 50**

Instructions:

1. Attempt all questions.
2. Section A contains 10 Questions. Each question carries 1 Mark.
3. Section B contains 04 Questions. Each question carries 4 Marks.
4. Section C contains 04 Questions. Each question carries 6 Marks.

Section – A

10X01 = 10 Marks

1. The Fluid use to transmit power in Pneumatics is-
   a) Air
   b) Water
   c) Oil
   d) Liquid
2. A hydraulic system operates at a pressure up to-
   a) 10-12 bar
   b) 7-8 bar
   c) 400 bar
   d) 700 bar
3. The fluid power system is based on-
   a) Bernoulli's principle
   b) Gas law
   c) Avogadro's law
   d) Pascal law
4. The Function of Tank is to-
   a) maintain a pressure range
   b) drain water content
   c) prevents from pressure fluctuation
   d) remove dust particles from the air

5. When PV=Constant, if we increase the volume then the pressure will-
    a) Remains constant
    b) Decrease
    c) Increase
    d) none of these
6. In Isochoric process, at constant volume-
    a) The pressure is directly proportional to temperature
    b) The pressure is inversely proportional to temperature
    c) Temperature is proportional to the volume
    d) Volume is directly proportional to the pressure
7. Which compressor is used as a portable compressor?
    a) Diaphragm compressor
    b) Single-stage piston compressor
    c) Screw compressor
    d) Vane compressor
8. What type of Refrigerant we are using in our Dryer?
    a) R22
    b) R34a
    c) R134a
    d) R34
9. What is L in FRL unit-
    a) Lubricant
    b) Liquid
    c) Lubricator
    d) Lubrication
10. Which of the following material is not used for pneumatic tubes?
    a) Nylon
    b) Aluminium
    c) Steel
    d) Polyurethane

Section – B

04X04 = 16 Marks

11. Draw the Symbol of Quick Exhaust Valve. Also, write its function.
12. Draw the symbol of air compressor and electric motor.
13. Explain the difference between Supply Air Throttling and Exhaust Air Throttling.
14. Draw a circuit diagram for Single Acting Cylinder with the combination of Meter In and Meter Out.

Section – C

04X06 = 24 Marks

15. Draw the symbol of the air filter and air dryer and explain the difference between them.
16. Explain the pressure regulator valve and draw its symbol also.
17. What is the function of the actuator and explain types of the linear actuator with their symbol?
18. Write down any six applications of Pneumatics.

Set-A

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Manufacturing Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, III Semester,

End-Sem. Examination

Course Code: SMS1304 | **Time: 2 Hour**

Course Name: Pneumatics | **Max. Marks: 50**

Answer Key

Section – A

10X01 = 10 Marks

1. The Fluid use to transmit power in Pneumatics is-
   - **a) Air**
   - b) Water
   - c) Oil
   - d) Liquid
2. A hydraulic system operates at a pressure up to-
   - a) 10-12 bar
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   - c) 400 bar
   - **d) 700 bar**
3. The fluid power system is based on-
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4. The Function of Tank is to-
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   - c) Increase
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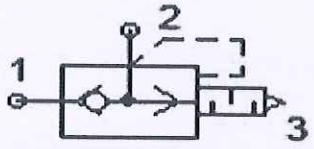
    b) Aluminium
    c) **Steel**
    d) Polyurethane

Section – B

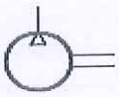
04X04 = 16 Marks

11. Draw the Symbol of Quick Exhaust Valve. Also, write its function.

    Ans. It removes air quickly from the actuator and increases the speed of the actuator.



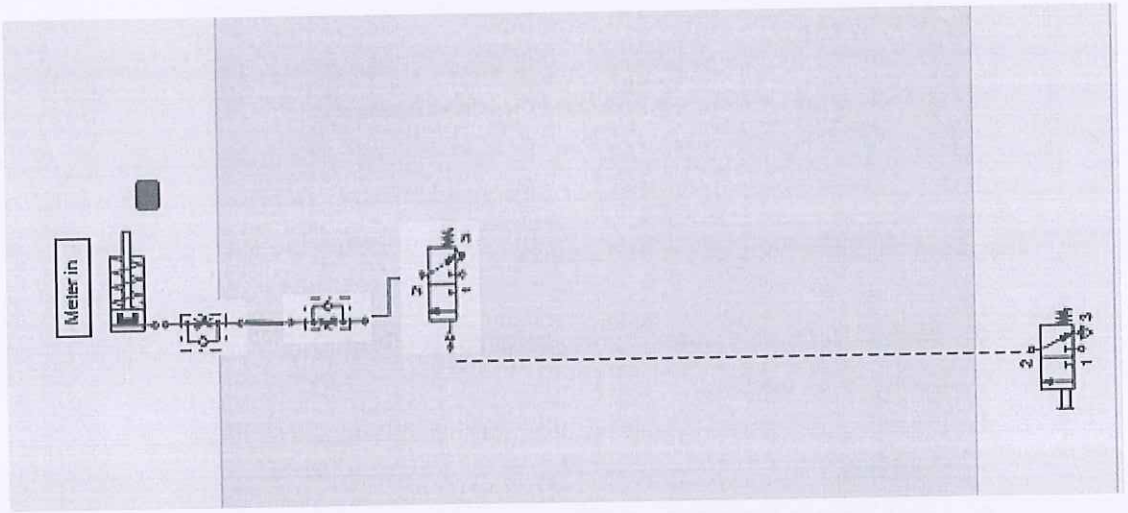
12. Draw the symbol of air compressor and electric motor.

1	Compressor		Compress the atmospheric air to the required pressure.
2	Electric Motor		Provide mechanical power to the compressor

13. Explain the difference between Supply Air Throttling and Exhaust Air Throttling.

Meter in – supply air throttling
Meter out – exhaust air throttling

14. Draw a circuit diagram for Single Acting Cylinder with the combination of Meter In and Meter Out.



Section – C

04X06 = 24 Marks

15. Draw the symbol of the air filter and air dryer and explain the difference between them.
16. Explain the pressure regulator valve and draw its symbol also.

The purpose of a regulator is to keep the operating pressure as per application that may also be known as secondary pressure that is constant regardless of fluctuations in either the line pressure (primary pressure) or air consumption.

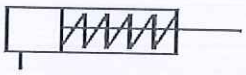
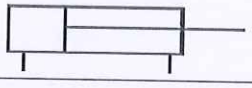
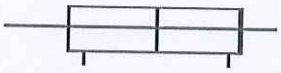
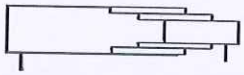
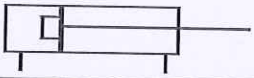
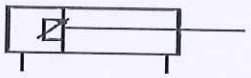
The inlet pressure must always be higher than the outlet pressure. If there is too low air pressure then it reduces efficiency and becomes uneconomical.

The pressure is regulated with the help of a diaphragm or piston to balance the outlet pressure against an adjustable spring force. The outlet pressure acts on one side of the diaphragm.

The spring force can be adjusted by an adjusting screw. The secondary pressure is set by screw loading the setting spring to hold the main valve opening that allowing flow from main pressure P1 to secondary pressure P2

When the outlet pressure P2 increases, the diaphragm moves against the spring force causing the valve seat to be partially or fully closed. Thus, the pressure is regulated by the flow volume.

17. What is the function of the actuator and explain types of the linear actuator with their symbol?

Symbol	Function
	**Single acting cylinder with spring return.** Air pushes the piston in one direction and piston returns by spring.
	**Double acting cylinder –single piston rod:** The force exerted by compressed air moves the piston in both directions.
	**Double acting cylinder –double piston rod:** It has piston rods extending from both ends of the cylinder. It produces equal force and speed on both sides of the cylinder.
	**Telescopic cylinder –double acting** is used where space is constraint. It is used for long stroke application like in pneumatic cranes, dump trucks, lift fork trucks, dipper wagon, etc.
	**Double acting cylinder – Fixed cushion on one side:** Cushioning is used in the end position to prevent sudden impact which otherwise may damage parts.
	**Double acting cylinder – variable cushion on one side:** Fixed cushion on one side, cushioning is variable in one direction by adjusting the orifice opening.

18. Write down any six applications of Pneumatics.

- Operation of system valves for air, water or chemicals
- Operation of doors
- Unloading of hoppers in building, steel making, mining and chemical industries.
- Lifting, Moving and Holding a part
- Dental drills
- Vacuum lifting of thin sheets.
- Pneumatic robots

Set-B

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Manufacturing Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, III Semester,

End-Sem. Examination

Set-B

Course Code: SMS1304 **Time: 2 Hour**

Course Name: Pneumatics **Max. Marks: 50**

Instructions:

1. Attempt all questions.
2. Section A contains 10 Questions. Each question carries 1 Mark.
3. Section B contains 04 Questions. Each question carries 4 Marks.
4. Section C contains 04 Questions. Each question carries 6 Marks.

Section – A

10X01 = 10 Marks

1. SI unit of pressure:
   a) N/m2
   b) bar
   c) Pascal
   d) All of above
2. Which type of valve we are using in pneumatics?
   a) Slide
   b) Plane
   c) Poppet
   d) Spool
3. A piston Diameter of 20mm is lifting two blocks of mass 10kg each. Then how much pressure required in bar?
   a) 5.00 bar
   b) 0.624 bar
   c) 6.24 bar
   d) None of the above
4. Which type of air dryer is used silica gel as a drying agent?
   a) Absorption air dryer
   b) Adsorption air dryer
   c) Refrigerant air dryer
   d) None of the above

5. What is the other name of the OR element?
    a) Dual pressure valve
    b) Throttle valve
    c) Check valve
    d) Shuttle valve
6. . Which air do we control in METER IN method?
    a) Air that going to the actuator
    b) Air that coming from the actuator
    c) Both of the above
    d) None of the above
7. In pneumatic, the volume flow of air is expressed in term of:
    a) M3/s
    b) L/m
    c) Both a and b
    d) None of the above
8. When PV=Constant, if we increase the volume then the pressure will.....?
    a) Remains constant
    b) Decrease
    c) Increase
    d) none of these
9. In Isochoric process, at constant volume-
    a) The pressure is directly proportional to temperature
    b) The pressure is inversely proportional to temperature
    c) Temperature is proportional to the volume
    d) Volume is directly proportional to the pressure
10. The fluid power system is based on:
    a) Bernoulli's principle
    b) Gas law
    c) Avogadro's law
    d) Pascal law

Section – B

04X04 = 16 Marks

11. Draw the Symbol of Quick Exhaust Valve. Also, write its function.
12. Define Pressure and Pascal Law.
13. What is the difference between Bistable and Monostable valves?
14. Draw the symbol of intercooler and lubricator.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Section – C

04X06 = 24 Marks

15. What is Air Production system? Explain all the components of the Air production system.
16. Explain any five differences between Pneumatic System and Hydraulic System.
17. Define to actuator mounting and explain their types with diagram.
18. Describe to the rotary actuator and their types.

set-B

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Manufacturing Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, III Semester,

End-Sem. Examination

Course Code: SMS1304

Course Name: Pneumatics

Answer key

Time: 2 Hour

Max. Marks: 50

Instructions:

1. Attempt all questions.
2. Section A contains 10 Questions. Each question carries 1 Mark.
3. Section B contains 04 Questions. Each question carries 4 Marks.
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Answer key

Section – A

10X01 = 10 Marks

1. SI unit of pressure:
   a) N/m2
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   c) Pascal
   d) All of above
2. Which type of valve we are using in pneumatics?
   a) Slide
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   d) Spool
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   d) None of the above
8. When PV=Constant, if we increase the volume then the pressure will.....?
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   c) Increase
   d) none of these
9. In Isochoric process, at constant volume-
   a) The pressure is directly proportional to temperature
   b) The pressure is inversely proportional to temperature
   c) Temperature is proportional to the volume
   d) Volume is directly proportional to the pressure
10. The fluid power system is based on:
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    b) Gas law
    c) Avogadro's law
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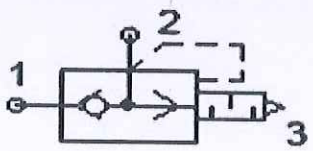
Section – B

04X04 = 16 Marks

11. Draw the Symbol of Quick Exhaust Valve. Also, write its function.
    It removes air quickly from the actuator and increases the speed of the actuator.



12. Define Pressure and Pascal Law.

The pressure is defined as force per unit area. The standard unit for pressure is the Pascal, which is Newton per square meter.

$$P = \frac{F}{A} = \frac{N}{mm^2}$$

This unit is small and to avoid huge number, we use the bar.

100,000 pa = 100KPa = 1bar

Pressure in the pneumatics is over-pressure (above the atmosphere pressure) and referred as gauge pressure.
A pressure below the atmosphere is under pressure or vacuum. **The standard atm. Pr is 1.013 bar.**

Pascal law

- An external pressure applied to a fluid in a closed vessel is uniformly transmitted throughout the fluid.

$$P1 = P2$$

$$\frac{F1}{A1} = \frac{F2}{A2}$$

13. What is the difference between Bistable and Monostable valves?

Monostable valve

These valves have a defined position to which they automatically return. Spring returned valves are monostable valves.

Bistable valve

These valves do not have any preferred position and remain in their position until another input signals are operated.

14. Draw the symbol of intercooler and lubricator.

Section – C

04X06 = 24 Marks

15. What is Air Production system? Explain all the components of the Air production system.

Compressor

Electric motor

Pressure switch

Check valve

Tank

Pressure gauge

Auto/Manual drain, Safety valve

Air dryer

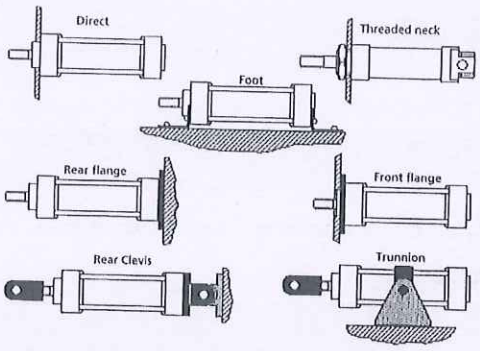
Line Filter, Intercooler

16. Explain any five differences between Pneumatic System and Hydraulic System.

S. No.	Hydraulic System	Pneumatic System
1.	It uses a pressurized liquid as a fluid	It uses compressed gas, usually air, as a fluid
2.	An oil hydraulic system operates at pressure up to 700 bar	A pneumatic system usually operates at 10–12 bar
3.	Generally designed as closed system	Usually designed as open system
4	Valve operations are difficult	Valve operations are easy
5	Heavier in weight	Lighter in weight
6	Pumps are used to provide pressurized liquids	Compressors are used to provide compressed gases
7	The system has fire hazards	The system is free from fire hazards
8	Automatic lubrication is provided	Special arrangements for lubrication

17. Define to actuator mounting and explain their types with diagram.

Mounting: The actuator mounting is the correct way. The manufacture offers a selection of mounting to meet the application or requirement. Some general mounting is as below.

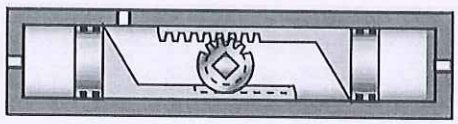


18. Describe to the rotary actuator and their types.

- These actuators give the rotational movement. These are mainly two types.

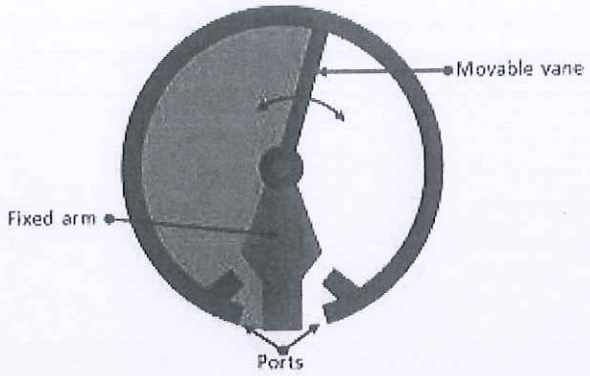
A. Rake and pinion type
B. Vane Type

Rake and pinion type: The shaft is an integral pinion gear driven by rake attached to double pistons. The standard angles of rotation are 90 to 180 degrees.



Vane type: The air pressure acts on a vane which is attached to the shaft. The size of stopper defines the rotation angle of 90,180 or 270 degree.

- To adjust any angle of rotation of the actuator, adjustable stops may be provided.


Movable vane
Fixed arm
Ports

Set - A

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Manufacturing Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, III Semester,

End-Sem. Examination

Set A

Course Code: SMS1305 **Time: 2 Hour**

Course Name: Material Science **Max. Marks: 50**

Instructions:

1. Attempt all questions.
2. Section A contains 10 Questions. Each question carries 1 Mark.
3. Section B contains 04 Questions. Each question carries 4 Marks.
4. Section C contains 04 Questions. Each question carries 6 Marks.

Section – A

10X01 = 10 Marks

1. Steel is an ___of iron
   a) Composite
   b) Alloy
   c) Neither Composite nor alloy
   d) Both a & b
2. "S 235 JRC+C" defines the material
   a) Copper
   b) Aluminum
   c) Brass
   d) None of these
3. Electrical melting process is a type of
   a) Oxidizing
   b) Refining
   c) Carburizing
   d) None of these
4. To improve the high temperature resistance property of a steel, which of the following alloying element is induced
   a) Nickel
   b) Cobalt
   c) Manganese
   d) Chromium

5. Steel rods in a concrete matrix is an example of
   a) Alloy
   b) Steel
   c) iron
   d) None
6. Generally, steel has how much amount of carbon?
   a) less than 2%
   b) greater than 2%
   c) less than 20%
   d) greater than 20%
7. What is meaning of JR in the material code "S 235 JRC+C"?
   a) yield strength l
   b) suitable for cold flanging
   c) quality grade (impact testing energy)
   d) type of steel
8. Which of the following is not refining process?
   a) basic oxygen process
   b) inert gas blowing process and
   c) the combined oxygen
   d) carburizing
9. _____ is the heavy metal (density > 5kg/dm3)
   a) Aluminium
   b) Magnesium
   c) Copper
   d) Titanium
10. Which is not a Natural material?
    a) Glass
    b) Granite
    c) Graphite
    d) Wood

Section – B

04X04 = 16 Marks

11. Define material science and also, write the importance of material science.
12. Explain the iron-carbon diagram in details with neat and clean diagram (200 words).
13. Describe the process of extraction of pig iron from iron ores.
14. Define Linear thermal expansion with formula.

Section – C

04X06 = 24 Marks

15. Write the short on the following
    a. Carbon steel b. Tool steel c. Alloy Steel d. Designation of Mild Steel
16. Explain the following process in details with diagram (150x2 word).
    a. Extraction of pig iron
    b. Basic oxygen process of refining
17. Explain any three production engineering properties of materials.
18. Draw the flow chart of the classification of materials based on their composition and common properties.

set-A

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Manufacturing Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, III Semester,

End-Sem. Examination

Course Code: SMS1305 | **Time: 2 Hour**

Course Name: Material Science | **Max. Marks: 50**

Answer Key

Section – A

10X01 = 10 Marks

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   c) Neither Composite nor alloy
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5. Steel rods in a concrete matrix is an example of
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   b) Steel
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8. Which of the following is not refining process?
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   - c) the combined oxygen
   - **d) carburizing**
9. _____ is the heavy metal (density > 5kg/dm3)
   - a) Aluminium
   - b) Magnesium
   - **c) Copper**
   - d) Titanium
10. Which is not a Natural material?
    - **a) Glass**
    - b) Granite
    - c) Graphite
    - d) Wood

Section – B

04X04 = 16 Marks

11. Define material science and also, write the importance of material science.

Answer:

Materials science, the study of the properties of solid materials and how those properties are determined by a material's composition and structure.

Importance of the material science:

1. Material science is important to study about the properties of material
2. to understand the micro structure of the material
3. It is also necessary for better understanding the material composition
4. to understand the extraction and manufacturing process of material

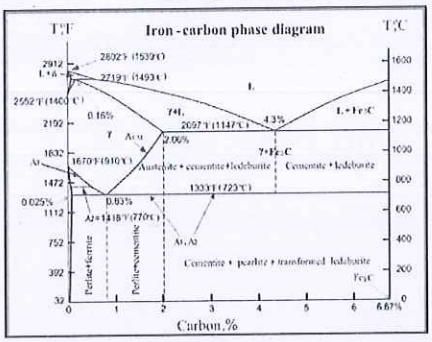
12. Explain the iron-carbon diagram in details with neat and clean diagram (200 words).

Answer:

Iron-carbon phase diagram describes the iron-carbon system of alloys containing up to 6.67% of carbon, discloses the phases compositions and their transformations occurring with the alloys during their cooling or heating.

Carbon content 6.67% corresponds to the fixed composition of the iron carbide Fe3C.

The diagram is presented in the picture:



The following phases are involved in the transformation, occurring with iron-carbon alloys:
L - Liquid solution of carbon in iron;

- **δ-ferrite – Solid solution of carbon in iron.**

Maximum concentration of carbon in δ-ferrite is 0.09% at 2719 °F (1493°C) – temperature of the peritectic transformation.
The crystal structure of δ-ferrite is BCC (cubic body centered).

- **Austenite – interstitial solid solution of carbon in γ-iron.**

Austenite has FCC (cubic face centered) crystal structure, permitting high solubility of carbon – up to 2.06% at 2097 °F (1147 °C).
Austenite does not exist below 1333 °F (723°C) and maximum carbon concentration at this temperature is 0.83%.

- **α-ferrite – solid solution of carbon in α-iron.**

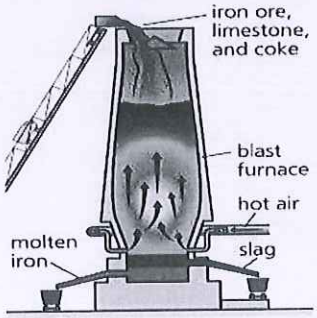
α-ferrite has BCC crystal structure and low solubility of carbon – up to 0.025% at 1333 °F (723°C).
α-ferrite exists at room temperature.

- **Cementite – iron carbide, intermetallic compound, having fixed composition Fe3C.**

Cementite is a hard and brittle substance, influencing on the properties of steels and cast irons.

13. Describe the process of extraction of pig iron from iron ores.

Ans. **Pig iron** is produced by smelting of iron ore in blast furnaces or by smelting ilmenite in electric furnaces. **Pig iron** is supplied in a variety of ingot sizes and weights, ranging from 3 kg up to more than 50 kg. The vast majority of **pig iron** is produced and consumed within integrated steel mill complexes.



14. Define Linear thermal expansion with formula.

Linear Thermal Expansion: The coefficient of linear thermal expansion α is the change in length Δl of a 1m long body that occurs for a temperature change $\Delta t = 1\ ^{0}C$.

The thermal expansion Δl must be taken into account for measuring instruments and mounted parts or for cast parts. Cast parts undergo heat shrinkage after casting and this must be compensated for by a size allowance.

Linear thermal expansion	$\Delta l = l_1 \cdot \alpha \cdot \Delta t$

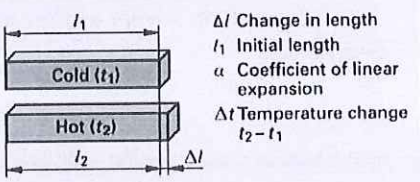


Figure 1: Linear thermal expansion

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Section – C

04X06 = 24 Marks

15. Write the short on the following

a. Carbon steel b. Tool steel c. Alloy Steel d. Designation of Mild Steel

Answer:

a. **Carbon steels:** are by far the most produced and used, accounting for about 90 percent of the world's steel production.

1. Low carbon steel
2. Medium carbon steel
3. High carbon steel

b. **Tool steel:** Tool steel refers to a variety of carbon steel and alloy steel that are particularly well-suited to be made into tools. Their suitability comes from their distinctive hardness, resistance to abrasion and deformation, and their ability to hold a cutting edge at elevated temperatures. As a result, tool steels are suited for use in the shaping of other materials

c. **Alloy steel:** Combining carbon steel with one or more alloying element to increase their Characteristics i.e. hardness, toughness, brittleness. Some alloying elements are-

a) Chromium:-It is used to increase hardness, toughness or wear resistance of steel.
b) Cobalt:-It improves high temperature resistance of steel.
c) Nickel:-It increase strength, toughness & corrosion resistance.
d) Manganese:-It Increase surface hardness & resistance to strain.
e) Molybdenum:-It increase fatigue strength or resistance to shock & heat.

d. **Designation of steel with its composition**

S 235 JRC+C

S: Type of steel (Structural steel)

235: Min. yield strength (mPa)

JR: Quality grade Impact testing energy

C1: Suitable for cold flanging

C2: Cold work Hardened

C	Si	Mn	P	S	Al	N	Cu
0.17	_	1.40	0.04	0.04	-	0.042	0.55

16. Explain the following process in details with diagram (150x2 word).

a. Extraction of pig iron

b. Basic oxygen process of refining

Answer:

a. Extraction of pig iron

- Raw materials (iron ore, coke and limestone) are added at the top of the furnace.
- Blasts of hot air (which give the furnace its name) are blown in near the bottom of the furnace. Load if iron ore, coke and limestone
- Oxygen in the blasts of air reacts with coke (carbon) to form carbon monoxide.2C + O2 ◊ 2COThis reaction is very exothermic and the temperature in the furnace reached 2000°C. Gas outlet
  The blast furnace1000°C
- As the carbon monoxide rises up the furnace, it reacts with the iron ore (iron(III) oxide to form iron.Fe2O3 + 3CO ◊ 2Fe + 3CO21500°C

- Molten iron runs to the bottom of the furnace. It is tapped off from time to time.
- The molten iron is used to make steel or poured into moulds to solidify. The large chunks of iron formed are called 'pigs' so this metal is called 'pig iron'.2000°C
  - Blasts of hot air
  - Blasts of hot air
  - Molten slag(impurities)
  - Outlet for the slag
  - Molten iron
  - Outlet for molten iron

b. Basic oxygen process of refining

- A **basic oxygen furnace**, called a BOF, is a pear-shaped steel vessel with refractory lining and an open top. The charge consists of about 75% molten iron and 25% scrap steel.
- **Steel** is produced in a basic oxygen furnace by the following steps:
- 1. The charge is dumped into the furnace.
- 2. An oxygen lance (pipe) is lowered and pure oxygen blows into the furnace at high pressure.
- 3. The oxygen reacts with the carbon and impurities that are in the molten iron.
- 4. When the carbon reaches the desired amount (up to 0.9%) the process is finished.

This is a low-cost process, as it does not use electricity or fuel, and makes steel quickly (in about 45 minutes), but it does not allow full control over the chemical composition of the steel.

17. Explain any three production engineering properties of materials.

Castability:

A material is castable if it forms a low viscosity melt that completely fills the mould and does not form any voids (shrinkage cavities) in the solidified material. The various types of cast iron, aluminium casting alloys, copper zinc and zinc casting alloys have good Castability.

Formability:

It is the ability of a material to be formed into a work-piece due to a plastic deformation when force is applied. Hot forming processes include hot rolling and forging, while cold forming processes include cold rolling, bending, folding and deep drawing.

Low carbon steels, soft iron and aluminium and copper wrought alloys exhibit high formability. Iron casting alloys are not formable.

Machinability:

It indicates whether and under which conditions a material can be manufactured using machining techniques, such as turning, milling and grinding. The surface quality of the machined surface, the machining conditions and the service life of the machine tools are quantifying parameters for the machinability.

Weldability:

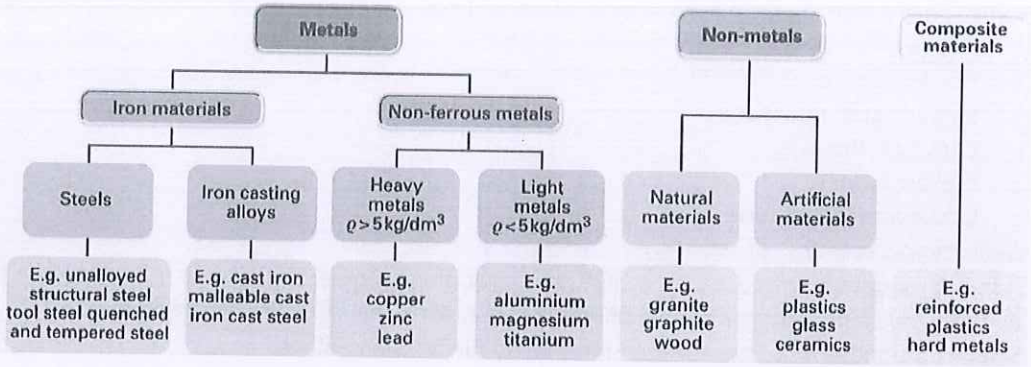
It describes the suitability or unsuitability of a material for welding. Unalloyed and low alloy steels with a low carbon content have good welding properties. High alloy steels as well as aluminium and copper alloys can also be welded using special welding methods.

Hardenability:

Hardenability and heat treatability refer to the capacity of a material to increase its hardness and strength by targeted heat treatment.

Most steels, some iron casting alloys and heat treatable aluminium alloys can be hardened.

18. Draw the flow chart of the classification of materials based on their composition and common properties.



Set-B

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Manufacturing Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, III Semester,

End-Sem. Examination

Set-B

Course Code: SMS1305 **Time: 2 Hour**

Course Name: Material Science **Max. Marks: 50**

Instructions:

1. Attempt all questions.
2. Section A contains 10 Questions. Each question carries 1 Mark.
3. Section B contains 04 Questions. Each question carries 4 Marks.
4. Section C contains 04 Questions. Each question carries 6 Marks.

Section – A

10X01 = 10 Marks

1. Density of Water in Kg/dm3 is-
   a) 1.0
   b) 2.7
   c) 8.9
   d) 11.3
2. "S 235 JRC+C" defines the material
   a) Copper
   b) Aluminum
   c) Brass
   d) None of these
3. _____ describes the ability of a material to conduct the electric current.
   a) Thermal Conductivity
   b) Density
   c) Electrical Conductivity
   d) None of the above
4. To improve the high temperature resistance property of a steel, which of the following alloying element is induced
   a) Nickel
   b) Cobalt
   c) Manganese
   d) Chromium

5. Steel rods in a concrete matrix is an example of
   a) Alloy
   b) Steel
   c) iron
   d) None
6. Generally, steel has how much amount of carbon?
   a) less than 2%
   b) greater than 2%
   c) less than 20%
   d) greater than 20%
7. What is meaning of JR in the material code "S 235 JRC+C"?
   a) yield strength l
   b) suitable for cold flanging
   c) quality grade (impact testing energy)
   d) type of steel
8. Which of the following is not refining process?
   a) basic oxygen process
   b) inert gas blowing process and
   c) the combined oxygen
   d) carburizing
9. _____ is the heavy metal (density > 5kg/dm3)
   a) Aluminium
   b) Magnesium
   c) Copper
   d) Titanium
10. Which is not a Natural material?
    a) Glass
    b) Granite
    c) Graphite
    d) Wood

Section – B

04X04 = 16 Marks

11. Explain the ferrous and non-ferrous material in detail.
12. Explain the iron-carbon diagram in details with neat and clean diagram (200 words).
13. Describe the process of extraction of pig iron from iron ores.
14. Define Linear thermal expansion with formula.

Section – C

04X06 = 24 Marks

15. Write the short on the following
    a. Carbon steel b. Tool steel c. Alloy Steel d. Designation of Mild Steel
16. Explain the following process in details with diagram (150x2 word).
    a. Extraction of pig iron
    b. Basic oxygen process of refining
17. Explain any three production engineering properties of materials.
18. Describe heavy metals and light metals.

Set-B

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Manufacturing Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, III Semester,

End-Sem. Examination

Course Code: SMS1305 | **Time: 2 Hour**

Course Name: Material Science | **Max. Marks: 50**

Answer Key

Section – A

10X01 = 10 Marks

1. Density of Water in Kg/dm3 is-
   - **a) 1.0**
   - b) 2.7
   - c) 8.9
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2. "S 235 JRC+C" defines the material
   - e) Copper
   - f) Aluminum
   - g) Brass
   - **h) None of these**
3. _____ describes the ability of a material to conduct the electric current.
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   b) inert gas blowing process and
   c) the combined oxygen
   d) **carburizing**
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   a) Aluminium
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   c) **Copper**
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10. Which is not a Natural material?
    a) **Glass**
    b) Granite
    c) Graphite
    d) Wood

Section – B

04X04 = 16 Marks

11. Explain the ferrous and non-ferrous material in detail.

Ferrous metals contain iron and non-ferrous metals do not. Non-ferrous metals are rarer, more valuable and resistant to corrosion, than ferrous metals. Ferrous and non-ferrous metals are both recyclable.

Ferrous metals list:

- Cast Iron
- Stainless Steel
- Carbon Steel
- Engineering Steel
- Wrought Iron

Ferrous metals list:

- Aluminum
- Cooper
- Nickel
- Chromium etc.

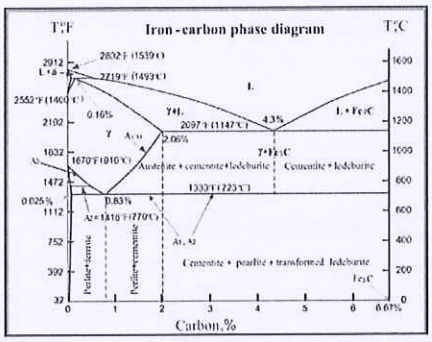
12. Explain the iron-carbon diagram in details with neat and clean diagram (200 words).

Answer:

Iron-carbon phase diagram describes the iron-carbon system of alloys containing up to 6.67% of carbon, discloses the phases compositions and their transformations occurring with the alloys during their cooling or heating.

Carbon content 6.67% corresponds to the fixed composition of the iron carbide Fe3C.

The diagram is presented in the picture:



The following phases are involved in the transformation, occurring with iron-carbon alloys:

L - Liquid solution of carbon in iron;

- **δ-ferrite – Solid solution of carbon in iron.**

Maximum concentration of carbon in δ-ferrite is 0.09% at 2719 °F (1493°C) – temperature of the peritectic transformation.

The crystal structure of δ-ferrite is BCC (cubic body centered).

- **Austenite – interstitial solid solution of carbon in γ-iron.**

Austenite has FCC (cubic face centered) crystal structure, permitting high solubility of carbon – up to 2.06% at 2097 °F (1147 °C).

Austenite does not exist below 1333 °F (723°C) and maximum carbon concentration at this temperature is 0.83%.

- **α-ferrite – solid solution of carbon in α-iron.**

α-ferrite has BCC crystal structure and low solubility of carbon – up to 0.025% at 1333 °F (723°C).

α-ferrite exists at room temperature.

- **Cementite – iron carbide, intermetallic compound, having fixed composition Fe3C.**

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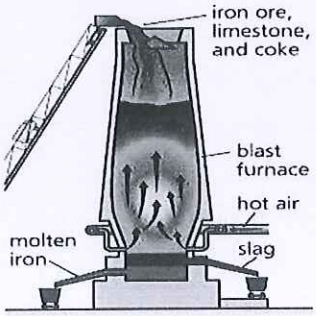

14. Define Linear thermal expansion with formula.

Linear Thermal Expansion: The coefficient of linear thermal expansion α is the change in length Δl of a 1m long body that occurs for a temperature change Δt = 1 °C.

The thermal expansion Δl must be taken into account for measuring instruments and mounted parts or for cast parts. Cast parts undergo heat shrinkage after casting and this must be compensated for by a size allowance.

Linear thermal expansion $\Delta l = l_1 \cdot \alpha \cdot \Delta t$

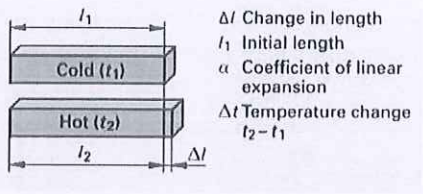

Figure 1: Linear thermal expansion

Section – C

04X06 = 24 Marks

15. Write the short on the following

a. Carbon steel b. Tool steel c. Alloy Steel d. Designation of Mild Steel

Answer:

a. **Carbon steels:** are by far the most produced and used, accounting for about 90 percent of the world's steel production.

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d. **Designation of steel with its composition**

S 235 JRC+C

S: Type of steel (Structural steel)

235: Min. yield strength (mPa)

JR: Quality grade Impact testing energy

C1: Suitable for cold flanging

C2: Cold work Hardened

C	Si	Mn	P	S	Al	N	Cu
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16. Explain the following process in details with diagram (150x2 word).
    a. Extraction of pig iron
    b. Basic oxygen process of refining

Answer:

a. Extraction of pig iron

- Raw materials (iron ore, coke and limestone) are added at the top of the furnace.
- Blasts of hot air (which give the furnace its name) are blown in near the bottom of the furnace. Load if iron ore, coke and limestone
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  The blast furnace1000°C
- As the carbon monoxide rises up the furnace, it reacts with the iron ore (iron(III) oxide to form iron.Fe2O3 + 3CO ◊ 2Fe + 3CO21500°C
- Molten iron runs to the bottom of the furnace. It is tapped off from time to time.
- The molten iron is used to make steel or poured into moulds to solidify. The large chunks of iron formed are called 'pigs' so this metal is called 'pig iron'.2000°C
  - Blasts of hot air
  - Blasts of hot air
  - Molten slag(impurities)
  - Outlet for the slag
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b. Basic oxygen process of refining

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- 3. The oxygen reacts with the carbon and impurities that are in the molten iron.
- 4. When the carbon reaches the desired amount (up to 0.9%) the process is finished.

This is a low-cost process, as it does not use electricity or fuel, and makes steel quickly (in about 45 minutes), but it does not allow full control over the chemical composition of the steel.

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Formability:

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Low carbon steels, soft iron and aluminium and copper wrought alloys exhibit high formability. Iron casting alloys are not formable.

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It indicates whether and under which conditions a material can be manufactured using machining techniques, such as turning, milling and grinding. The surface quality of the machined surface, the machining conditions and the service life of the machine tools are quantifying parameters for the machinability.

Weldability:

It describes the suitability or unsuitability of a material for welding. Unalloyed and low alloy steels with a low carbon content have good welding properties. High alloy steels as well as aluminium and copper alloys can also be welded using special welding methods.

Hardenability:

Hardenability and heat treatability refer to the capacity of a material to increase its hardness and strength by targeted heat treatment.

Most steels, some iron casting alloys and heat treatable aluminium alloys can be hardened.

18. Describe heavy metals and light metals.

- **Heavy metals (density greater than 5 kg/dm³):** Heavy metals include copper, zinc, chromium, nickel and lead. They are predominantly used for their special material properties.

— Copper as winding wires for example, due to its good electrical conductivity.

— Chromium and nickel as alloying elements in steel for example, in order to achieve or improve certain properties.

- **Light metals (density less than 5 kg/dm³):** Light metals include aluminium, magnesium and titanium. In some cases, these may represent light materials with a very high strength. Their main area of application is lightweight components, e.g. for cars and aircraft.

set-A

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Manufacturing Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, III Semester,

End-Sem. Examination

Set-A

Course Code: SMS1306 **Time: 2 Hour**

Course Name: Advanced grinding & 3D Measurement **Max. Marks: 50**

Instructions:

1. Attempt all questions.
2. Section A contains 10 Questions. Each question carries 1 Mark.
3. Section B contains 04 Questions. Each question carries 4 Marks.
4. Section C contains 04 Questions. Each question carries 6 Marks.

Section – A

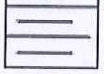
10X01 = 10 Marks

1. Following is an abrasive cutting-
   a) Milling
   b) Grinding
   c) Laser beam cutting
   d) All of the above
2. Grinding is best suited to the machining of-
   a) Soft material
   b) Very Hard material
   c) Both A and B
   d) None of the above
3. Full form of SPA3 -
   a) Servo Power Amplifier
   b) Servo pack Amplifier
   c) Service position Amplifier
   d) Service power Amplifier
4. Travelling distance in X-Axis in CMM
   a) 500
   b) 400
   c) 600
   d) 450

5. Which symbol is used for Position?

a) 

b) 

c) 

d) None of the above

6. For the structural steel which type of abrasive we use?
   a) Diamond
   b) Boron nitride
   c) Aluminium oxide
   d) Silicon carbide
7. The diameter of the Reference sphere used for calibration in CMM.
   a) 25.000 mm
   b) 29.000 mm
   c) 29.900 mm
   d) 29.999 mm
8. RF abbreviation is used for which bond type?
   a) Vitrified
   b) Resinoid
   c) Metal
   d) Fibre-reinforced
9. What is the range of abrasive grain size number for medium designation in grinding wheel?
   a) 10 to 24
   b) 30 to 60
   c) 70 to 220
   d) Over 220
10. Controller used in CMM-
    a) Renishaw
    b) Siemens
    c) Fanuc
    d) Mitibhushi

Section – B

04X04 = 16 Marks

11. Define grinding.
12. Which coolant is used by us as cutting oil? Write any 5 uses of Cutting Oil
13. Make a figure of CMM probe head assembly.
14. Write the name of the different grinding wheel with a diagram.

Section – C

04X06 = 24 Marks

15. Explain the pore structure in the grinding wheel.
16. Explain the various parts of CMM.
17. Write down the applications and advantages of CMM.
18. Draw symbols of the following given tolerances;
    a. Cylindricity
    b. Parallelism
    c. Total runout
    d. Perpendicularity

set - A

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Manufacturing Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, III Semester,

End-Sem. Examination

Course Code: SMS1306 | **Time: 2 Hour**

Course Name: Advanced grinding & 3D Measurement | **Max. Marks: 50**

Answer Key

Section – A

10X01 = 10 Marks

1. Following is an abrasive cutting-
   a) Milling
   b) Grinding
   c) Laser beam cutting
   d) All of the above
2. Grinding is best suited to the machining of-
   a) Soft material
   b) Very Hard material
   c) Both A and B
   d) None of the above
3. Full form of SPA3 -
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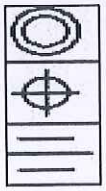
4. Travelling distance in X-Axis in CMM
   a) 500
   b) 400
   c) 600
   d) 450
5. Which symbol is used for Position?
   a)
   b)
   c)



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04X04 = 16 Marks

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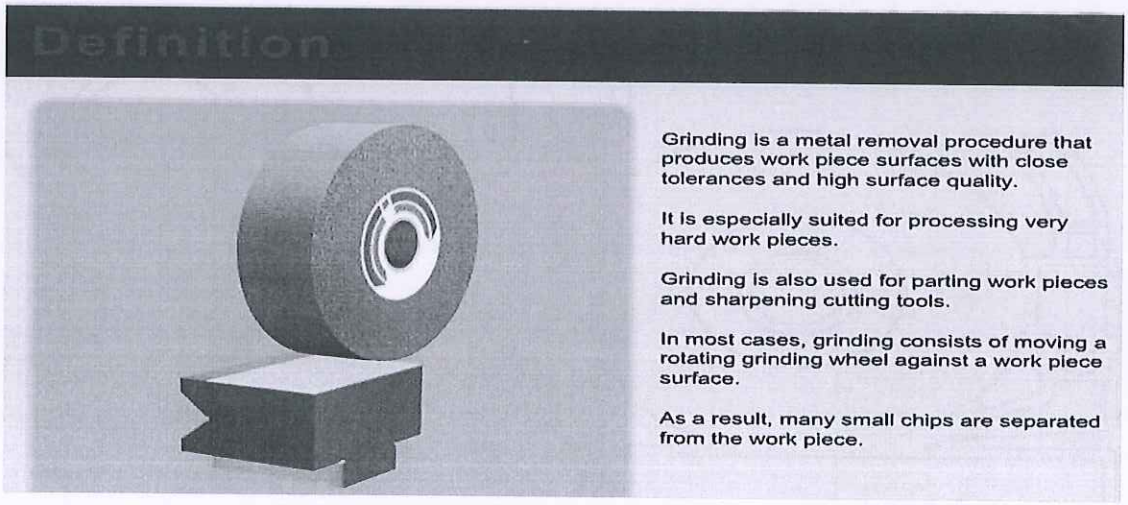

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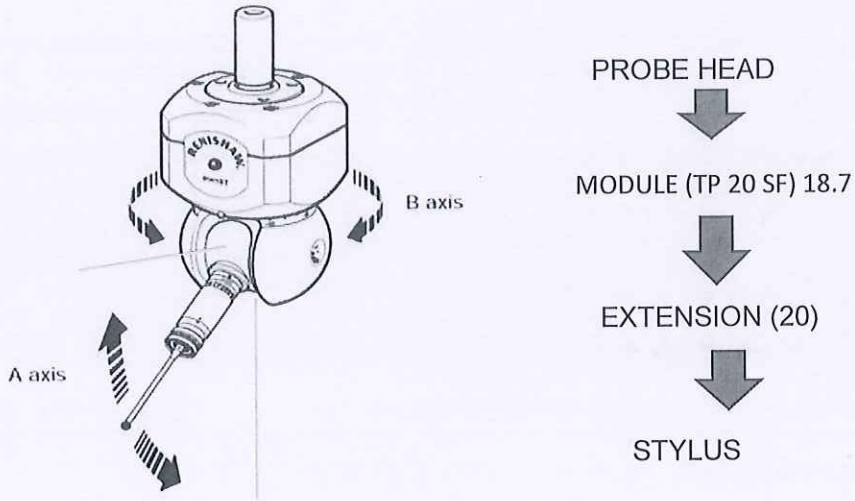

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Section – C

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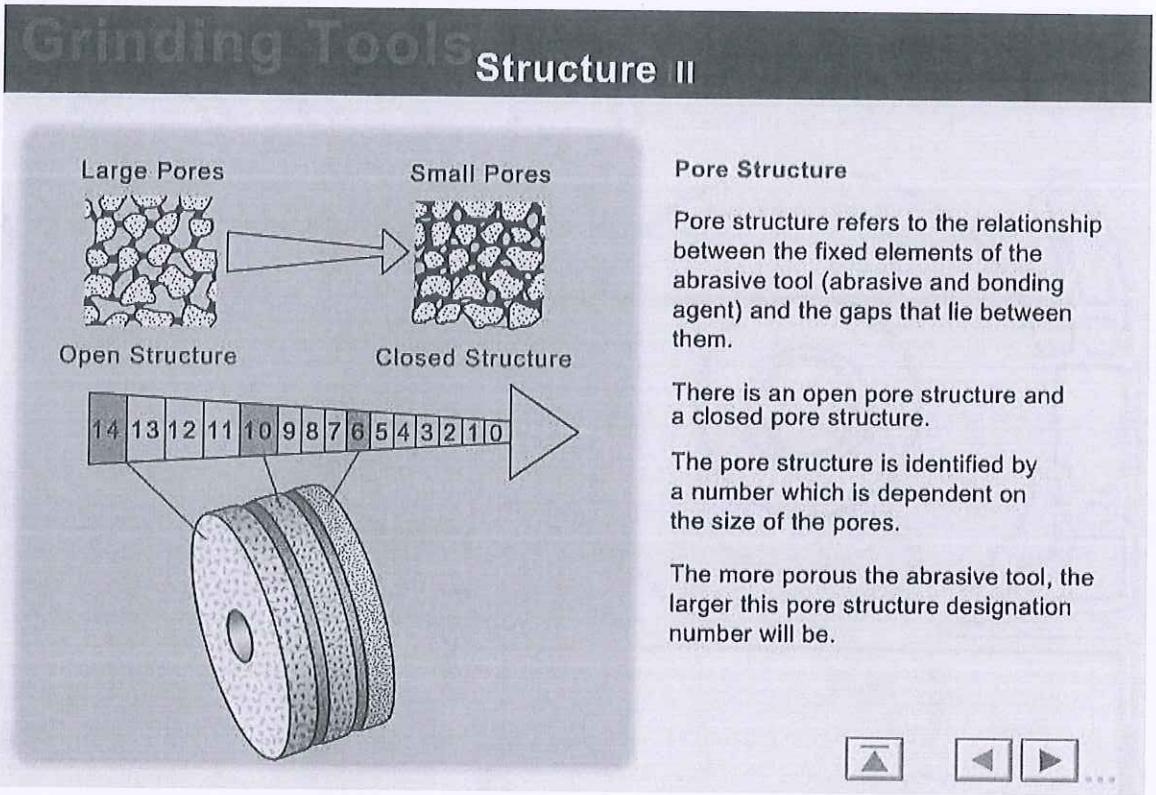

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- ✓ Aerospace Industries
- ✓ Automotive
- ✓ Food processing
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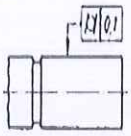
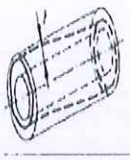
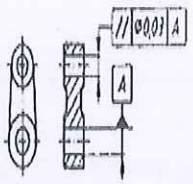
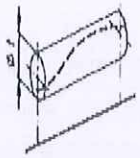
18. Draw symbols of the following given tolerances;
    a. Cylindricity
    b. Parallelism
    c. Total runout
    d. Perpendicularity

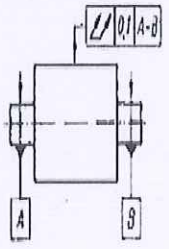
Cylindricity

⌭	Cylindricity			The considered surface shall be contained between two coaxial cylinders 0,1 apart.

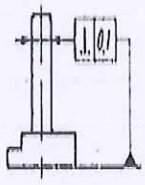
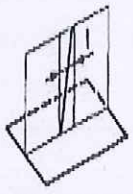
Parallelism

//	Parallelism of a line (axis) with reference to a datum line			The toleranced axis shall be contained in a cylindrical zone of diameter 0,03, parallel to the datum axis A (datum line).

Total run out

↗	Total run-out radial			The total radial run-out shall not be greater than 0,1 at any point on the specified surface during several revolutions about the datum axis A-B, and with relative axial movement between part and measuring instrument. The movement shall be guided along a line having a theoretically perfect form of the contour and being in correct position to the datum axis.

Perpendicularity

⊥	Perpendicularity of a line (axis) with reference to a datum surface			The axis of the cylinder, to which the tolerance frame is connected, shall be contained between two parallel planes 0,1 apart, perpendicular to the datum surface.

Set-B

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Manufacturing Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, III Semester,

End-Sem. Examination

Set-B

Course Code: SMS1306 **Time: 2 Hour**

Course Name: Advanced grinding & 3D Measurement **Max. Marks: 50**

Instructions:

1. Attempt all questions.
2. Section A contains 10 Questions. Each question carries 1 Mark.
3. Section B contains 04 Questions. Each question carries 4 Marks.
4. Section C contains 04 Questions. Each question carries 6 Marks.

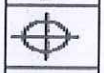
Section – A

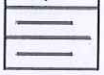
10X01 = 10 Marks

1. What is the designation for hardness grade range A-D of an abrasive tool?
   a) Soft
   b) Extremely soft
   c) Hard
   d) Very hard
2. Grinding is best suited to the machining of-
   a) Soft material
   b) Very Hard material
   c) Both A and B
   d) None of the above
3. Full form of SPA3
   a) Servo Power Amplifier
   b) Servo pack Amplifier
   c) Service position Amplifier
   d) Service power Amplifier
4. Travelling distance in Z axis in CMM-
   a) 500
   b) 400
   c) 600
   d) 450

5. Which symbol is used for Position:

a) 

b) 

c) 

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6. For the structural steel which type of abrasive we use?
   a) Diamond
   b) Boron nitride
   c) Aluminum oxide
   d) Silicon carbide
7. Diameter of Reference sphere used for calibration in CMM.
   a) 25.000 mm
   b) 29.000 mm
   c) 29.900 mm
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8. RF abbreviation is used for which bond type?
   a) Vitrified
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9. What is the range of abrasive grainsize number for medium designation in grinding wheel?
   a) 10 to 24
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Section – B

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BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Section – C

04X06 = 24 Marks

15. Explain the pore structure in the grinding wheel?
16. Explain the various parts of CMM.
17. Write down the applications and advantages of CMM.
18. Draw symbols of the following given tolerances;
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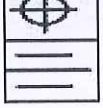
   b) 
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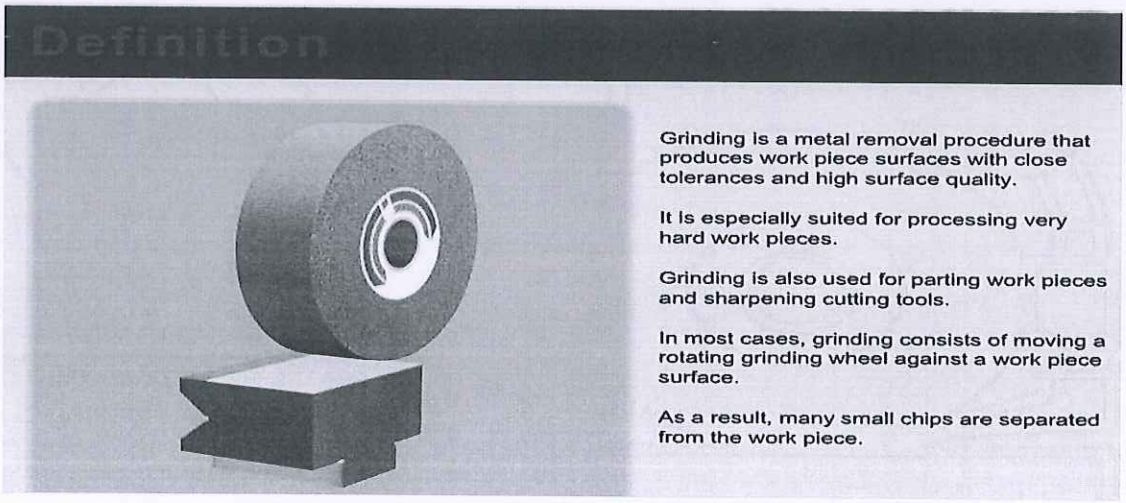

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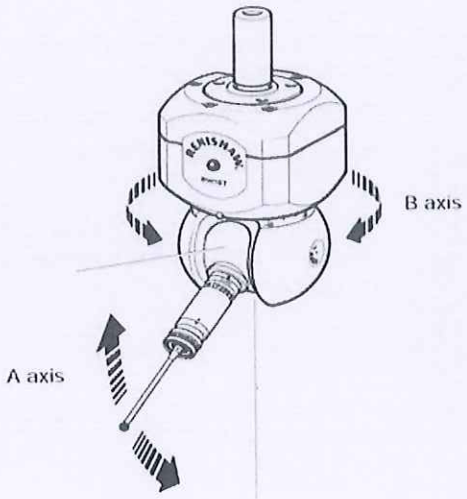

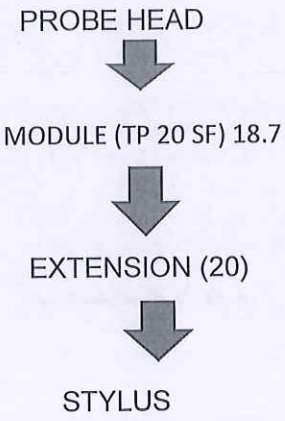

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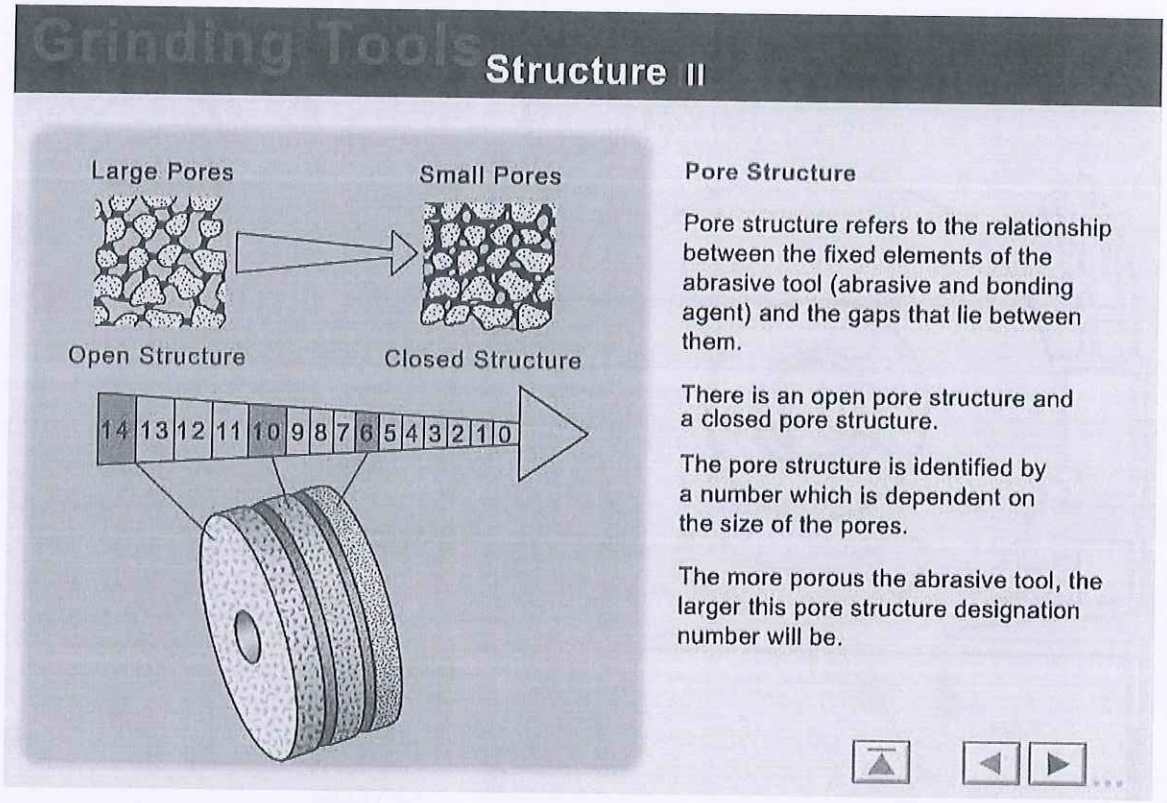

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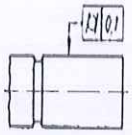
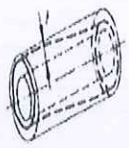
⌭	Cylindricity			The considered surface shall be contained between two coaxial cylinders 0,1 apart.

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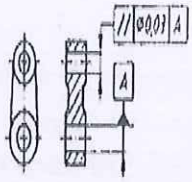
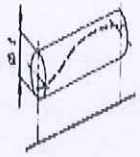
//	**Parallelism** of a line (axis) with reference to a datum line			The toleranced axis shall be contained in a cylindrical zone of diameter 0,03, parallel to the datum axis A (datum line).

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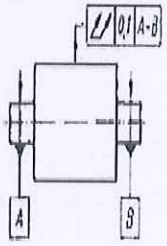
↗	**Total run-out** radial			The total radial run-out shall not be greater than 0,1 at any point on the specified surface during several revolutions about the datum axis A-B, and with relative axial movement between part and measuring instrument. The movement shall be guided along a line having a theoretically perfect form of the contour and being in correct position to the datum axis.

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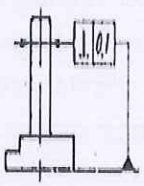
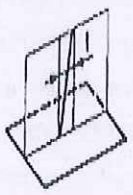
⊥	**Perpendicularity** of a line (axis) with reference to a datum surface			The axis of the cylinder, to which the tolerance frame is connected, shall be contained between two parallel planes 0,1 apart, perpendicular to the datum surface.