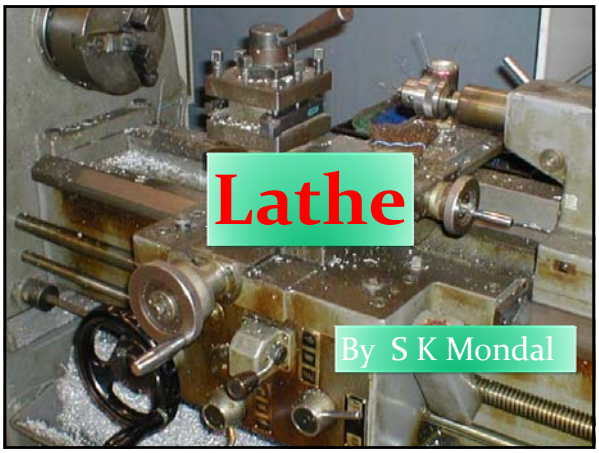
Set-2



IES - 2001

The spindle speed range in a general purpose lathe is divided into steps which approximately follow

(a) Arithmetic progression
(b) Geometric progression
(c) Harmonic progression
(d) Logarithmic progression

Ans. (b)

IES - 1992

Feed gear box for a screw cutting lathe is designed on the basis of

(a) Geometric progression
(b) Arithmetic progression
(c) Harmonic progression
(d) None

Ans. (a)

Example

How much machining time will be required to reduce the diameter of a cast iron rod from 120 mm to 116 mm over a length of 100 mm by turning using a carbide insert. Cutting velocity is 100 m/min and feed rate = 0.2 mm/rev.

IES 2010

In turning a solid round bar, if the travel of the cutting tool in the direction of feed motion is 1000 mm, rotational speed of the workpiece is 500 rpm, and rate of feed is 0.2 mm/revolution, then the machining time will be

(a) 10 seconds (b) 100 seconds
(c) 5 minutes (d) 10 minutes

Ans. (d)

IES - 2003

The time taken to face a workpiece of 72 mm diameter, if the spindle speed is 80 r.p.m. and cross-feed is 0.3 mm/rev, is

(a) 1.5 minutes (b) 3.0 minutes
(c) 5.4 minutes (d) 8.5 minutes

Ans. (a)

Set-2

IAS - 2002

A 150 mm long, 12 mm diameter 304 stainless steel rod is being reduced in diameter to 11·5 mm by turning on a lathe. The spindle rotates at N = 400 rpm and the tool is travelling at an axial speed of 200 mm/min. The time taken for cutting is given by

(a) 30 s (b) 36 s
(c) 1 minute (d) 45 s

Ans. (d)

IES - 2004

A medium carbon steel workpiece is turned on a lathe at 50 m/min. cutting speed 0.8 mm/rev feed and 1.5 mm depth of cut. What is the rate of metal removal?

(a) 1000 mm^3/min
(b) 60,000 mm^3/min
(c) 20,000 mm^3/min
(d) Can not be calculated with the given data

Ans. (b)

IES - 2006

For taper turning on centre lathes, the method of swiveling the compound rest is preferred for:

(a) Long jobs with small taper angles
(b) Long jobs with steep taper angles
(c) Short jobs with small taper angles
(d) Short jobs with steep taper angles

Ans. (d)

Example

Find the angle at which the compound rest should be set up to turn taper on the workpiece having a length of 200 mm, larger diameter 45 mm and the smaller 30 mm.

IES - 1992

Tail stock set over method of taper turning is preferred for

(a) Internal tapers
(b) Small tapers
(c) Long slender tapers
(d) Steep tapers

Ans. (c)

IAS - 2002

The amount of offset of tail stock for turning taper on full length of a job 300 mm long which is to have its two diameters at 50 mm and 38 mm ultimately is

(a) 6 mm (b) 12 mm
(c) 25 mm (d) 44 mm

Ans. (a)

Set-2

IES - 1998

A 400 mm long shaft has a 100 mm tapered step at the middle with 4° included angle. The tailstock offset required to produce this taper on a lathe would be

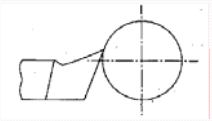
(a) 400 sin 4° (b) 400 sin 2°

(c) 100 sin 4° (d) 100 sin 2°

Ans. (b)

IES 2010

The effect of centering error when the tool is set above the center line as shown in the figure results effectively in



1. Increase in rake angle.
2. Reduction in rake angle.
3. Increase in clearance angle.
4. Reduction in clearance angle.

Which of these statements is/are correct?

(a) 1 only (b) 1 and 4 only

(c) 2 and 4 only (d) 1, 2, 3 and 4

Ans. (b)

GATE - 2002

A lead-screw with half nuts in a lathe, free to rotate in both directions has

(a) V-threads

(b) Whitworth threads

(c) Buttress threads

(d) ACME threads **Ans. (d)**

GATE – 2008

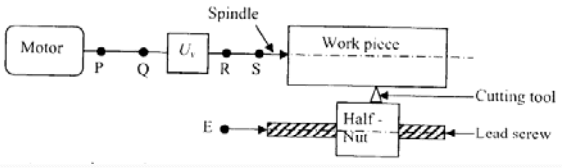
The figure shows an incomplete schematic of a conventional lathe to be used for cutting threads with different pitches. The speed gear box U_v, is shown and the feed gear box U_s, is to be placed. P, Q. R and S denote locations and have no other significance. Changes in U_v, should NOT affect the pitch of the thread being cut and changes in U_s, should NOT affect the cutting speed.

Contd.....

Ans. (c)

GATE -2008

Contd....



The correct connections and the correct placement of U_s *are given by*

(a) Q and E are connected. U_s, is placed between P and Q.

(b) S and E are connected. U_s is placed between R and S.

(c) Q and E are connected. U_s, is placed between Q and E.

(d) S and E are connected. U_s, is placed between S and E.

GATE - 2003

Quality screw threads are produced by

(a) Thread milling

(b) Thread chasing

(c) Thread cutting with single point tool

(d) Thread casting

Ans. (b)

Set-2

IES 2010

For producing both internal and external screw threads, the method used is

(a) Thread chasing with multiple-rib chasers

(b) Thread milling and multiple-thread cutters

(c) Thread tapping with taps

(d) Die threading with self-opening die heads

Ans. (b)

IES 2011

External threads can be produced by :

1. Rolling
2. Grinding
3. Milling

(a) 1 and 3 only

(b) 1 and 2 only

(c) 2 and 3only

(d) 1, 2 and 3

Ans. (d)

IES - 2004

Match List I (Cutting tools) with List II (Features) and select the correct answer using the codes given below the Lists:

Ans. (c)

	List I		List II
A.	Turning tool	1.	Chisel edge
B.	Reamer	2.	Flutes
C.	Milling cutter	3.	Axial relief
		4.	Side relief

Codes:	**A**	**B**	**C**		**A**	**B**	**C**
(a)	1	2	3	(b)	4	3	2
(c)	4	2	3	(d)	1	3	2

GATE-1994

To get good surface finish on a turned job, one should use a sharp tool with a .....feed and..... speed of rotation of the job.

(a) Minimum, minimum

(b) Minimum, maximum

(c) Maximum, maximum

(d) Maximum, minimum

Ans. (b)

IES - 1996

In turning of slender rods, it is necessary to keep the transverse force minimum mainly to

(a) Improve the surface finish

(b) Increase productivity

(c) Improve cutting efficiency

(d) Reduce vibrations and chatter.

Ans. (d)

IES - 2009

What is the number of jaws in self-centred chuck?

(a) Eight

(b) Six

(c) Four

(d) Three

Ans. (d)

Set-2

IES - 1999

Which one of the following sets of forces are encountered by a lathe parting tool while groove cutting?

(a) Tangential, radial and axial
(b) Tangential and radial
(c) Tangential and axial
(d) Radial and axial

Ans. (a)

IES - 2009

Which one of the following methods should be used for turning internal taper only?

(a) Tailstock offset
(b) Taper attachment
(c) Form tool
(d) Compound rest

Ans. (d)

IES - 1998

A single start thread of pitch 2 mm is to be produced on a lathe having a lead screw with a double start thread of pitch 4 mm. The ratio of speeds between the spindle and lead screw for this operation is

(a) 1 : 2 (b) 2: 1
(c) 1: 4 (d) 4: 1

Ans. (d)

IES - 1993

It is required to cut screw threads of 2 mm pitch on a lathe. The lead screw has a pitch of 6 mm. If the spindle speed is 60 rpm, then the speed of the lead screw will be

(a) 10 rpm (b) 20 rpm
(c) 120 rpm (d) 180 rpm

Ans. (b)

IES - 1992

Which of the following statement is incorrect with reference of lathe cutting tools?

(a) The flank of the tool is the surface below and adjacent to the cutting edges
(b) The nose is the corner, or chamfer joining the side cutting and the end cutting edges
(c) The heel is that part of the which is shaped to produce the cutting edges and face
(d) The base is that surface of the shank which against the support and takes tangent

Ans. (c)

IES - 2006

It is required to cut screw threads with double start and 2 mm pitch on a lathe having lead screw pitch of 6 mm. What is the speed ratio between lathe spindle and lead screw?

(a) 1 : 3 (b) 3: 1
(c) 2 : 3 (d) 3: 2

Ans. (d)

Set-2

IES - 1997

Consider the following operations:

1. Under cutting 2. Plain turning
3. Taper turning 4. Thread cutting

The correct sequence of these operations in machining a product is

(a) 2, 3, 4, 1 (b) 3, 2, 4, 1
(c) 2, 3, 1, 4 (d) 3, 2, 1, 4

Ans. (c)

IES - 2009

A capstan lathe is used to mass-produce, in batches of 200, a particular component. The direct material cost is Rs 4 per piece, the direct labour cost is Rs 3 per piece and the overhead costs are 400% of the labour costs. What is the production cost per piece?

(a) Rs 19 (b) Rs 23
(c) Rs 16 (d) Rs 15

Ans. (a)

IES - 2007

Assertion (A): In a multi-spindle automatic lathe, the turret tool holder is indexed to engage the cutting tools one by one for successive machining operations.

Reason (R): Turret is a multiple tool holder so that for successive machining operation, the tools need not be changed.

(a) Both A and R are individually true and R is the correct explanation of A

(b) Both A and R are individually true but R is **not** the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true **Ans. (a)**

IES - 1995

Consider the following characteristics:

1. Multiple operations can be performed
2. Operator's fatigue is greatly reduced.
3. Ideally suited for batch production
4. A break-down in one machine does not affect the flow of products.
5. Can accommodate modifications in design of components, within certain limits.

The characteristics which can be attributed to special purpose machines would include

(a) 1, 3 and 4 (b) 1, 2 and 4
(c) 2, 3 and 5 (d) 1, 2 and 5 **Ans. (c)**

IES - 1996

Assertion (A): Special purpose machine tools and automatic machine tools are quite useful for job shops

Reason (R): Special purpose machine tools can do special types of machining work automatically

(a) Both A and R are individually true and R is the correct explanation of A

(b) Both A and R are individually true but R is **not** the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true **Ans. (d)**

IES - 2003

Which one of the following mechanisms is employed for indexing of turret in an automatic lathe?

(a) Whitworth (b) Rack and pinion
(c) Ratchet and pawl (d) Geneva wheel

Ans. (c)

Set-2

IES - 2009

For the manufacture of screw fasteners on a mass scale, which is the most suitable machine tool?

(a) Capstan lathe
(b) Single-spindle automatic lathe
(c) CNC turning centre (lathe)
(d) CNC machining centre

Ans. (b)

IES - 2001

The indexing of the turret in a single-spindle automatic lathe is done using

(a) Geneva mechanism
(b) Ratchet and Pawl mechanism
(c) Rack and pinion mechanism
(d) Whitworth mechanism

Ans. (b)

IES - 1995

Assertion (A): In a Swiss - type automatic lathe, the turret is given longitudinal feed for each tool in a specific order with suitable indexing.

Reason (R): A turret is a multiple tool holder to facilitate machining with each tool by indexing without the need to change the tools.

(a) Both A and R are individually true and R is the correct explanation of A
(b) Both A and R are individually true but R is **not** the correct explanation of A
(c) A is true but R is false
(d) A is false but R is true **Ans. (d)**

IES - 1992

Maximum production of small and slender parts is done by

(a) Watch maker's lathe
(b) Sliding head stock automatic lathe
(c) Multi-spindle automatic lathe
(d) Capstan lathe

Ans. (c)

IES - 2007

Screw threads are produced on solid rods by using which of the following?

(a) Dies (b) Punch
(c) Mandrel (d) Boring bar

Ans. (a)

IAS - 2007

Which one of the following is the characteristic for capstan lathe?

(a) Rate of production is low
(b) Labour cost is high
(c) Used for handling jobs of varying shapes and sizes
(d) Capstan head is mounted on a slide

Ans. (d)

Set-2

IAS - 2002

Consider the following statements related to Turret lathe:

1. Turret is mounted directly on the saddle.
2. Turret is mounted on an auxiliary slide.
3. Much heavier and larger jobs than Capstan lathe can be produced.

Which of the above statements is/are correct?

(a) 1 and 3 (b) 2 and 3
(c) 1 only (d) 2 only

Ans. (a)

IAS - 1996

Apart from hexagonal turret, the elements (s) in a turret lathe include (s)

(a) Cross-slide tool post
(b) Cross-slide tool post and rear tool post
(c) Cross-slide tool post and tail stock
(d) Teal tool post and tail stock

Ans. (a)

IAS - 2004

Swiss type screw machines have

(a) Turrets (b) Radial slides
(c) Spindle carriers (d) Tool posts

Ans. (c)

IAS - 2001

Consider the following operations and time required on a multi spindle automatic machine to produce a particular job

1. Turning ...1.2 minutes
2. Drilling ...1.6 minutes
3. Forming ...0.2 minute
4. Parting ...0.6 minute

The time required to make one piece (cycle time) will be

(a) 0.6 minutes (b) 1.6 minutes
(c) 3.6 minutes (d) 0.9 minute **Ans. (b)**

IAS - 1995

Assertion (A): In a multi-spindle automat, the turret is indexed to engage each of the cutting tool mounted on it.

Reason(R): Turret is a multiple tool holder so that the machining can be continued with each tool without the need to change the tool.

(a) Both A and R are individually true and R is the correct explanation of A
(b) Both A and R are individually true but R is **not** the correct explanation of A
(c) A is true but R is false
(d) A is false but R is true **Ans. (d)**

IAS - 1994

A multi-spindle automat performs four operations with times 50, 60, 65 and 75 seconds at each of its work centers. The cycle time (time required to manufacture one work piece) in seconds will be

(a) 50 + 60 + 65 + 75
(b) (50 + 60 + 65 + 75) /4
(c) 75/4
(d) 75

Ans. (d)

Set-2

IAS - 1998

Assertion (A): For thread cutting, the spindle speed selected on a lathe, is very low.

Reason (R): The required feed rate is low in threading operation.

(a) Both A and R are individually true and R is the correct explanation of A

(b) Both A and R are individually true but R is **not** the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true **Ans. (c)**

IAS - 1998

Consider the following statements associated with the lathe accessories:

1. Steady rest is used for supporting a long job in between head stock and tail stock.
2. Mandrel is used for turning small cylindrical job.
3. Collects are used for turning disc-shaped job.

Of these statements:

(a) 1 and 2 are correct (b) 2 and 3 are correct

(c) 3 alone is correct (d) 1 alone is correct

Ans. (d)

IES 2011

In Norton type feed gearbox for cutting Whitworth standard threads with a standard TPI Leadscrew, power flows from:

(a) Spindle to Tumbler gear to Norton cone to Meander drive to Leadscrew

(b) Spindle to Norton cone to Tumbler geat to Meander drive to Leadscrew

(c) Spindle t o Tumbler gear to Meander drive to Norton cone to Leadscrew

(d) Spindle to Norton cone to Meander drive to Tumbler gear to Leadscrew **Ans. (a)**

IAS - 2000

Consider the following features:

1. All spindles operate simultaneously,
2. One piece is completed each time the tools are withdrawn and the spindles are indexed
3. The tool slide indexes or revolves with the spindle carrier

Which of these features are characteristics of a multi-spindle automatic machine used for bar work?

(a) 1, 2 and 3 (b) 1 and 2

(c) 2 and 3 (d) 1 and 3 **Ans. (a)**

Set-2

IES - 2004

Consider the following statements:

The helical flute in a twist drill provides the necessary

1. Clearance angle for the cutting edge
2. Rake angle for the cutting edge
3. Space for the chip to come out during drilling
4. Guidance for the drill to enter into the workpiece

Which of the statements given above are correct?

(a) 1 and 2 (b) 2 and 3
(c) 3 and 4 (d) 1 and 4 **Ans. (b)**

IES - 2003

The purpose of helical grooves in a twist drill is to

1. Improve the stiffness
2. Save a tool material
3. Provide space for chip removal
4. Provide rake angle for the cutting edge

Select the correct answer using the codes given below:

Codes:

(a) 1 and 2 (b) 2 and 3
(c) 3 and 4 (d) 1 and 4 **Ans. (c)**

GATE- 1996

The rake angle in a drill

(a) Increases from centre to periphery
(b) decreases from centre to periphery
(c) Remains constant
(d) Is irrelevant to the drilling operation

Ans. (a)

IES - 1997

The rake angle in a twist drill

(a) Varies from minimum near the dead centre to a maximum value at the periphery
(b) Is maximum at the dead centre and zero at the periphery
(c) Is constant at every point of the cutting edge
(d) Is a function of the size of the chisel edge.

Ans. (a)

IES - 1992

A drill for drilling deep holes in aluminum should have

(a) High helix angle (b) Taper shank
(c) Small point angle (d) No lip

Ans. (a)

Set-2

GATE- 1997

Helix angle of fast helix drill is normally

(a) 35°
(b) 60°
(c) 90°
(d) 5°

Ans. (a)

IES - 1992

Low helix angle drills are preferred for drilling holes in

(a) Plastics (b) Copper
(c) Cast steel (d) Carbon steel

Ans. (d)

Example

A hole with 40-mm diameter and 50-mm depth is to be drilled in mild steel component. The cutting speed can be taken as 65 m/min and the feed rate as 0.25 mm/rev. Calculate the machining time and the material removal rate.

GATE- 2002

The time taken to drill a hole through a 25 mm thick plate with the drill rotating at 300 r.p.m. and moving at a feed rate of 0.25 mm/revolution is

(a) 10 sec (b) 20 sec
(c) 60 sec (d) 100 sec

Ans. (b)

GATE- 2004

Through holes of 10 mm diameter are to be drilled in a steel plate of 20 mm thickness. Drill spindle speed is 300 rpm, feed 0.2 mm/ rev and drill point angle is 120°. Assuming drill over travel of 2 mm, the time for producing a hole will be

(a) 4 seconds (b) 25 seconds
(c) 100 seconds (d) 110 seconds

Ans. (b)

IES - 2002

The arm of a radial drilling machine is being raised at a speed of 3.9 m/min by single start square threads of 6 mm pitch and 30 mm diameter. The speed of the screw

(a) Is 650 rpm
(b) Is 180 rpm
(c) Is 130 rpm
(d) Cannot be determined as the data is insufficient

Ans. (a)

Set-2

IES - 1994

The ratio between two consecutive spindle speeds for a six-speed drilling machine using drills of diameter 6.25 to 25 mm size and at a cutting velocity of 18 m/min is

(a) 1.02 (b) 1.32
(c) 1.62 (d) 1.82

Ans. (b)

IES - 2009

What is the drilling time for producing a hole in an MS sheet of 25 mm thickness using an HSS drill of 20 mm diameter? The cutting speed and feed for drill are 20 m/min and 0.25 mm/revolution respectively, Neglect time taken for setting up, approaching and travelling of tools.

(a) 0.314 min (b) 0.236 min
(c) 0.438 min (d) 0.443 min

Ans. (a)

IES - 2002

A 31.8 mm H.S.S. drill is used to drill a hole in a cast iron block 100 mm thick at a cutting speed 20 m/min and feed 0.3 mm/rev. If the over travel of drill is 4 mm and approach 9 mm, the time required to drill the hole is

(a) 1 min 40 s (b) 1 min 44 s
(c) 1 min 49 s (d) 1 min 53 s

Ans. (d)

IAS - 1999

To drill a 10 mm diameter hole through a 20 mm thick M.S. plate with a drill bit running at 300 rpm and a feed of 0.25 mm per revolution, time taken will be

(a) 8 s (b) 16 s
(c) 24 s (d) 32 s

Ans. (b)

IAS - 1994

The time (in minutes) for drilling a hole is given by

$$t = \frac{Depth \quad of \quad the \quad hole + h}{Feed \times RPM}$$

where 'h' is the

(a) Length of the drill
(b) Drill diameter
(c) Flute length of the drill
(d) Cone height of the drill.

Ans. (d)

IES - 1999

Match List-I (Drill bits) with List-II (Applications) and select the correct answer using the codes given below the Lists:

List-I		**List-II**
A. Core drill	1.	To enlarge a hole to a certain depth so as to accommodate the bolt head of a screw
B. Reamer	2.	To drill and enlarge an already existing hole in a casting
C. Counter bore drill	3.	To drill a hole before making internal thread
D. Tap drill	4.	To improve the surface finish and dimensional accuracy of the already drilled hole

Code:	A	B	C	D		A	B	C	D
(a)	1	3	2	4	(b)	2	3	1	4
(c)	2	4	1	3	(d)	3	2	4	1

Ans. (c)

Set-2

IES - 1999

Which one of the following processes results in the best accuracy of the hole made?

(a) Drilling (b) Reaming
(c) Broaching (d) Boring

Ans. (b)

IES - 1999

Consider the following statements regarding reaming process:

1. Reaming generally produces a hole larger than its own diameter
2. Generally rake angles are not provided on reamers.
3. Even numbers of teeth are preferred in reamer design.

Which of these statements are correct?

(a) 1 and 2 (b) 2 and 3
(c) 1 and 3 (d) 1, 2 and 3 **Ans. (b)**

IES - 1998

Match List-I with List-II and select the correct answer using the codes given below the lists:

List-I	List-II
A. Reaming	1. Smoothing and squaring surface around the hole for proper seating
B. Counter-boring	2. Sizing and finishing the hole
C. Counter-sinking	3. Enlarging the end of the hole
D. Spot facing	4. Making a conical enlargement at the end of the hole

Ans. (d)

Code:	**A**	**B**	**C**	**D**		**A**	**B**	**C**	**D**
(a)	3	2	4	1	(b)	2	3	1	4
(c)	3	2	1	4	(d)	2	3	4	1

IES - 1994

In reaming process

(a) Metal removal rate is high
(b) High surface finish is obtained.
(c) High form accuracy is obtained
(d) High dimensional accuracy is obtained.

Ans. (d)

IES - 1993

A hole of 30 mm diameter is to be produced by reaming. The minimum diameter permissible is 30.00 mm while the maximum diameter permissible is 30.05 mm. In this regard, consider the following statements about the reamer size:

1. The minimum diameter of the reamer can be less than 30 mm.
2. The minimum diameter of the reamer cannot be less than 30 mm.
3. The maximum diameter of the reamer can be more than 30.05 mm.
4. The maximum diameter of the reamer must be less than 30.05 mm.

Of these statements **Ans. (d)**

(a) 1 and 4 are correct (b) 1 and 3 are correct
(c) 2 and 3 are correct (d) 2 and 4 are correct

Set-2

IES - 1998

A component requires a hole which must be within the two limits of 25.03 and 25.04 mm diameter. Which of the following statements about the reamer size are correct?

1. Reamer size cannot be below 25.03 mm.
2. Reamer size cannot be above 25.04 mm.
3. Reamer size can be 25.04 mm.
4. Reamer size can be 25.03 mm.

Select the correct answer using the codes given below:

(a) 1 and 3 (b) 1 and 2 **Ans. (b)**

(c) 3 and 4 (d) 2 and 4

IAS - 1999

For reaming operation of blind hole, the type of reamer required is

(a) Straight flute reamer

(b) Right hand spiral fluted reamer

(c) Left hand spiral fluted reamer

(d) None of the above

Ans. (b)

IAS - 2003

Match List I (Operation) with List II (Application) and select the correct answer using the codes given below the lists:

List-I (Operation)	**List-II (Application)**
(A) Reaming	1. Used for enlarging the end of a hole to give it a conical shape for a short distance
(B) Boring	2. Used for enlarging only a limited portion of the hole
(C) Counter boring	3. Used for finishing a hole
(D) Counter sinking	4. Used for enlarging a hole

Ans. (c)

Codes:	**A**	**B**	**C**	**D**		**A**	**B**	**C**	**D**
(a)	3	2	4	1	(b)	1	4	2	3
(c)	3	4	2	1	(d)	1	2	4	3

IES - 1992

Shell reamers are mounted on

(a) Tool holders (b) Amour plates

(c) Arbor (d) Shanks

Ans. (c)

IES - 1993

The main purpose of boring operation, as compared to drilling is to:

(a) Drill a hole

(b) Finish the drilled hole

(c) Correct the hole

(d) Enlarge the existing hole

Ans. (d)

IES - 1994

Enlarging an existing circular hole with a rotating single point tool is called

(a) Boring (b) Drilling

(c) Reaming (d) Internal turning.

Ans. (a)

Set-2

IES - 1992

Which of the machine tools can be used for boring

1. Lathe
2. Drilling machine
3. Vertical milling machine
4. Horizontal milling machine

(a) 1, 2, 3 (b) 1, 3, 4
(c) 2 and 4 (d) 1, 2, 3, 4

Ans. (a)

IES - 2000

Which one of the following sets of tools or tools and processes are normally employed for making large diameter holes?

(a) Boring tool
(b) BTA tools (Boring and trepanning association) and gun drill
(c) Gun drill and boring tool
(d) Boring tools and trepanning

Ans. (d)

IES - 1996

Which of the following statements are correct?

1. A boring machine is suitable for a job shop.
2. A jig boring machine is designed specially for doing more accurate work when compared to a vertical milling machine.
3. A vertical precision boring machine is suitable for boring holes in cylinder blocks and liners.

(a) 1, 2 and 3 (b) 1 and 2
(c) 2 and 3 (d) 1 and 3

Ans. (a)

IES - 1995

The effects of setting a boring tool above centre height leads to a/an.

(a) Increase in the effective rake angle and a decrease in the effective clearance angle.
(b) Increase in both effective rake angle and effective clearance angle.
(c) Decrease in the effective rake angle and an increase in the effective clearance angle.
(d) Decrease in both effective rank angle and effective clearance angle. **Ans. (c)**

JWM 2010

Consider the following operations regarding boring machines :

1. Counterboring
2. Countersinking
3. Trepanning

Which of the above operations is/are correct ?

(a) 1, 2 and 3 (b) 1 and 2 only
(c) 2 and 3 only (d) 1 only

Ans. (a)

IES - 2007

Among the following machining processes, which can be used for machining flat surfaces?

1. Shaping 2. Milling 3. Broaching

Select the correct answer using the code given below:

(a) 1 and 2 only (b) 1 and 3 only
(c) 2 and 3 only (d) 1, 2 and 3

Ans. (d)

Set-2

IES - 1993

Assertion (A): Soluble oils are employed with broaching machine.

Reason (R): Soluble oils have excellent cooling effect.

(a) Both A and R are individually true and R is the correct explanation of A

(b) Both A and R are individually true but R is **not** the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true **Ans. (a)**

IES – 1993, 2001

Assertion (A): No separate feed motion is required during broaching.

Reason (R): The broaching machines are generally hydraulically operated.

(a) Both A and R are individually true and R is the correct explanation of A

(b) Both A and R are individually true but R is **not** the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true **Ans. (b)**

IES - 2001

The screw and nut in a broaching machine are changed from square thread to ACME thread. The power requirement of the machine at the same r.p.m. will

(a) Remain same

(b) Decrease

(c) Increase

(d) Depend on the operator

Ans. (c)

IAS - 2004

Which one of the following is true for the last few teeth of a broach which are meant for fine finishing?

(a) They have equal diameter

(b) They have increasing diameter

(c) They have decreasing diameter

(d) They have alternately increasing and decreasing diameter.

Ans. (a)

IES - 2005

Match List I (Tool) with List II (Element of Tool) and select the correct answer using the code given below the Lists: **Ans. (c)**

	List I		List II
A	Broach	1.	Tang
B.	Reamer	2.	Pilot
C.	Drill	3.	Front taper
D.	Carbide insert face mill	4.	Bond
		5.	Sweeper tooth

Codes:	A	B	C	D		A	B	C	D
(a)	2	5	1	3	(b)	1	3	4	5
(c)	2	3	1	5	(d)	1	5	4	3

IES - 2002

Match List I with List II and select the correct answer:

List I (Machine tool)		List II (Features)	
A.	Lathe	1.	Push or pull tool
B.	Drilling machine	2.	Rachet and pawl mechanism
C.	Shaper	3.	Dividing head
D.	Broaching machine	4.	Hollow tapered spindle
		5.	Face plate Ans. (d)

Codes:	A	B	C	D		A	B	C	D
(a)	2	4	5	1	(b)	5	3	2	4
(c)	2	3	5	4	(d)	5	4	2	1

Set-2

Milling

By S K Mondal

Example

A C50 steel flat surface of dimensions 100 mm × 250 mm is to be produced on a horizontal axis milling machine. An HSS slab mill with a 100 mm diameter and 150 mm width is to be used for the purpose. The milling cutter has 8 teeth.

Calculate the machining time assuming that entire stock can be removed in one depth of 2 mm.

Given,

Feed, f = 0.13 mm/tooth,

Cutting speed, V = 20 m/min.

Ans. 4.11 min

GATE - 1995

List-I (Manufacturing Processes)		**List- II (Condition)**
(A) Finish turning	1.	Backlash eliminator
(B) Forming	2.	Zero rake
(C) Thread cutting	3.	Nose radius
(D) Down milling	4.	Low speed

Codes:	**A**	**B**	**C**	**D**		**A**	**B**	**C**	**D**
(a)	2	3	4	1	(b)	3	4	1	2
(c)	1	2	3	4	(d)	4	1	2	3

Ans. (a)

GATE - 1993

A milling cutter having 8 teeth is rotating at 150 rpm. If the feed per tooth is 0.1, the table speed in mm per minute is

(a) 120 (b) 187

(c) 125 (d) 70

Ans. (a)

IES - 2003

In milling machine, the cutting tool is held in position by

(a) Chuck (b) Spindle

(c) Arbor (d) Tool holder

Ans. (c)

IES - 2009

The arbor of a milling machine is used to hold which one of the following?

(a) Spindle (b) Over-arm

(c) Cutting tool (d) Mandrel

Ans. (c)

Set-2

IES - 1994

Consider the following operations:

1. Cutting key ways on shafts
2. Cutting external screw threads.
3. Cutting teeth of spur gears
4. Cutting external splines.

Those which can be performed with milling cutters would include

(a) 1 and 2 (b) 2,3 and 4

(c) 1 and 3 (d) 1,2,3 and 4 .

Ans. (d)

IES - 1992

A set of eight form relieved milling cutters for each module is provided to enable cutting of gears of different

(a) Materials

(b) Types e.g. spur, helical, etc.

(c) Number of teeth

(d) Width of gears

Ans. (c)

IES - 2007

What is the process of removing metal by a milling cutter which is rotated against the direction of travel of the work piece, called?

(a) Down milling (b) Up milling

(c) End milling (d) Face milling

Ans. (b)

GATE - 1992

In horizontal milling process..... (up/down) milling provides better surface finish and..... (up-down) milling provides longer tool life.

Ans. down, down

IES - 1997

Consider the following statements:

In Up milling process,

1. The cutter starts the cut from the machined surface and proceeds upwards.
2. The cutter starts the cut from the top surface and proceeds downwards.
3. The job is fed in a direction opposite to that of cutter rotation.
4. The job is fed in the same direction as that of cutter rotation.

Of these statements correct are:

(a) 1 and 3 (b) 1 and 4

(c) 2 and 3 (d) 2 and 4 **Ans. (a)**

IES - 1995

Assertion (A): Up milling or climb milling is commonly used for machining castings and forgings.

Reason (R): Up milling can be done on universal milling machines.

(a) Both A and R are individually true and R is the correct explanation of A

(b) Both A and R are individually true but R is **not** the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true **Ans. (d)**

Set-2

IES - 2005

Which one of the following statements is correct?

In up-milling operation, the undeformed chip thickness,

a) Is zero at the start of the cut and increases to a maximum value just before the tooth disengages the workpiece.

b) Increases to the maximum value at the centre of the travel and decreases towards the end of tooth engagement.

c) Has a maximum value just after the cut is started and drops to zero at the end of the cut.

d) Remains unchanged. **Ans. (a)**

IES - 1993

Climb milling is chosen while machining because

(a) The chip thickness increases gradually

(b) It enables the cutter to dig in and depth of cut

(c) The specific power consumption is reduced

(d) Better surface finish can be obtained

Ans. (d)

IES 2010

Assertion (A): Climb or down milling operation ensures smoother operation of the machine tool and longer tool life as compared to the conventional up milling operation.

Reason (R): In climb or down milling operation, the rotational motion of the cutter as well as the feed motion of the work-piece are in the same direction, and the depth of cut is maximum at the entry point as the cutter engages the workpiece.

(a) Both A and R are individually true and R is the correct explanation of A

(b) Both A and R are individually true but R is NOT the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true Ans. (b)

IES - 2002

Assertion (A): Virtually all modern milling machines are capable of doing down-milling.

Reason (R): In down-milling the cutter tends to push the work along and lift it upward from the table. This action tends to eliminate any effect in looseness in the feed screw and nut of the milling machine table and results in smooth cut.

(a) Both A and R are individually true and R is the correct explanation of A

(b) Both A and R are individually true but R is **not** the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true **Ans. (c)**

IES - 2004

The cutting speed of a milling cutter while cutting brass is:

(a) 45 to 60 m/min (b) 30 to 40 m/min

(c) 25 to 35 m/min (d) 15 to 20 m/min

Ans. (a)

IES - 2006

Gang milling is a

(a) Milling process for generating hexagonal surfaces

(b) Process of cutting gears

(c) Process in which two or more cutters are used simultaneously

(d) Milling operation combined with turning

Ans. (c)

Set-2

IES - 2009

For machining, which one of the following gang milling operations is employed?

(a) Threads
(b) Bores
(c) Grooves
(d) Steps on prismatic parts

Ans. (d)

IES - 1995

In a milling operation two side milling cutters are mounted with a desired distance between them so that both sides of a work piece can be milled simultaneously. This set up is called.

(a) Gang milling (b) Straddle milling
(c) String milling (d) Side milling.

Ans. (b)

IES - 2004

One brand of milling machine has the following two index plates supplied along with the indexing head:

Plate 1: 15, 16, 17, 18, 19, 20 hole circles

Plate 2: 21, 23, 27, 29, 31, 33 hole circles

It is proposed to mill a spur gear of 28 teeth using simple indexing method. Which one of the following combinations of index plate and number of revolutions is correct?

(a) Plate 1: 1 revolution and 9 holes in 18 hole circles
(b) Plate 2: 1 revolution and 9 holes in 21 hole circles
(c) Plate 2: 1 revolution and 9 holes In 33 hole circles
(d) Plate 1: 1 revolution and 9 holes In 15 hole circles

Ans. (b)

IES - 2000

One of the index plates of a milling machine dividing head has the following hole circles: 15; 16; 17; 18; 19; 20

A gear wheel of 34 teeth has to be milled by simple indexing method. To machine each tooth, the index crank has to be rotated through

(a) 17 holes in the 20-hole circle
(b) 18 holes in the 20-hole circle
(c) 1 revolution and 3 holes in 17-hole circle
(d) 1 revolution and 2 holes in 18-hole circle

Ans. (c)

IES - 1999

A straight teeth slab milling cutter of 100 mm diameter and 10 teeth rotating at 200 r.p.m. is used to remove a layer of 3 mm thickness from a steel bar. If the table feed is 400 mm/minute, the feed per tooth in this operation will be

(a) 0.2 mm (b) 0.4 mm
(c) 0.5 mm (d) 0.6 mm

Ans. (a)

IES - 2002

A side and face cutter 125 mm diameter has 10 teeth. It operates at a cutting speed of 14 m/min with a table traverse 100 mm/min. The feed per tooth of the cutter is

(a) 10 mm (b) 2.86 mm
(c) 0.286 mm (d) 0.8 mm

Ans. (c)

Set-2

IES - 2004

Match List I (Milling problem) with List II (Probable causes) and select the correct answer using the codes given below the Lists:

	List I		List II	Ans. (b)
A.	Chatter	1.	Too high feed	
B.	Poor surface finish	2.	Lack of rigidity in machine fixtures, bar or workpiece	
C.	Loss of accuracy	3.	High cutting load	
D.	Cutter burrs	4.	Radial relief too great	
		5.	Not enough lubricant	

Codes:	A	B	C	D		A	B	C	D
(a)	2	1	5	3	(b)	2	1	3	5
(c)	4	5	2	3	(d)	4	2	3	5

IAS - 2001

Which one of the following statements are correct in respect of up-milling and down-milling?

1. In up-milling the cutter rotates in a direction opposite to that of workpiece travel whereas in down-milling the cutter rotates in a direction similar to that of workpiece travel.
2. In down-milling chip will be thin at the beginning and increase to a maximum at the end of the cut and reverse will be the case for a chip formed by up-milling.
3. Down-milling is desirable with milling cutters having a high radial rake angle when compared to up-milling.
4. Down-milling forces the work-piece against the milling table to exert more pressure while up-milling tends to lift the workpiece from the table.

Select the correct answer using the codes given below:

Codes:

(a) 1, 2 and 3 (b) 1, 2 and 4
(c) 3 and 4 (d) 1, 3 and 4 **Ans. (d)**

IAS - 1998

Which of the following statements are true of face milling?

1. Face milling cutter is held on an arbor.
2. It has two rake angles· axial rake and radial rake.
3. The maximum chip thickness equals the feed per tooth.
4. The chip thickness varies from a minimum at the start of cut to a maximum at the end of cut.

Select the correct answer using the codes given below:

Codes :

(a) 1 and 2 (b) 2 and 3
(c) 2 and 4 (d) 3 and 4 **Ans. (b)**

IAS - 2001

Which of the following mechanisms are suitable for indexing the table of rotary transfer line?

1. Rack and pinion
2. Ratchet and pawl
3. Lead screw
4. Geneva mechanism

Select the correct answer by using the codes given below:

Codes:

(a) 1, 2 and 3 (b) 2, 3 and 4
(c) 1, 3 and 4 (d) 1, 2 and 4 **Ans. (d)**

IAS - 2000

Consider the following mechanisms:

1. Geneva gearing
2. Rack and pinion
3. Ratchet and pawl

Which of these mechanisms are used to index the work table on a transfer machine?

(a) 1 and 2 (b) 2 and 3
(c) 1 and 3 (d) 1, 2 and 3

Ans. (d)

IAS - 1994

A standard dividing head is equipped with the following index plates

1. Plate with 12, 16, 17, 18, 19, 20 holes circles
2. Plate with 21, 23, 27, 29, 31, 33 holes circles
3. Plate with 37, 39, 41,43,47,49 holes circles

For obtaining 24 divisions on a work piece by simple indexing

(a) Hole plate 2 alone can be used
(b) Hole plates 1 and 2 can be used
(c) Hole plates 1 and 3 can be used **Ans. (d)**
(d) Any of the three hole plates can be used

Set-2

IAS - 2003

A milling cutter of 70 mm diameter with 12 teeth is operating at a cutting speed of 22 m/min and a feed of 0.05 mm/tooth. The feed per minute is

(a) 110 m/min (b) 35 mm/min

(c) 6 mm/min (d) 60 mm/min

Ans (d)

IES-1994

Which one of the following operations is carried out at the minimum cutting velocity if the machines are equally rigid and the tool work materials are the same?

(a) Turning
(b) Grinding
(c) Boring
(d) Milling

Ans (d)

IES 2011

Match List –I with List –II and select the correct answer using the code given below the lists : **Ans (b)**

List –I	List –II
A. Lathe	1. Flute
B. Shaper	2. Universal indexing
C. Drilling machine	3. Leadscrew
D. Milling machine	4. Rocker arm

	A	B	C	D		A	B	C	D
(a)	2	4	1	3	(b)	3	4	1	2
(c)	2	1	4	3	(d)	3	1	4	2

IES- 2002

Match List I with List II and select the correct answer:

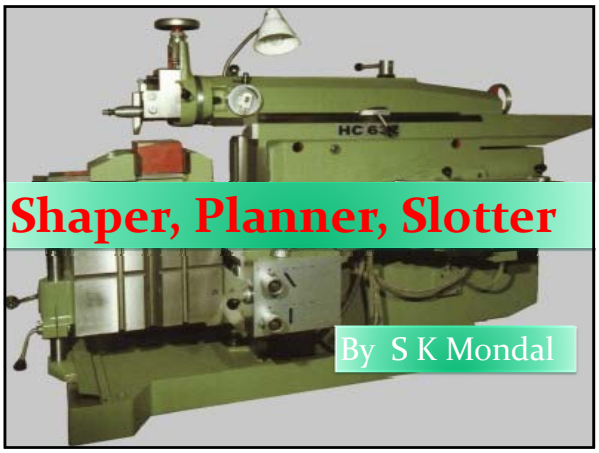
List I (Machine tools)	List II (Machine tool parts)
A. Lathe	1. Lead strew
B. Milling machine	2. Rocker arm
C. Shaper	3. Universal indexing
D. Drilling machine	4. Flute **Ans (d)**

Codes:	**A**	**B**	**C**	**D**		**A**	**B**	**C**	**D**
(a)	4	2	3	1	(b)	1	3	2	4
(c)	4	3	2	1	(d)	1	2	3	4

Ch-7: Milling

Q No	Option	Q. No	Option
1	B	7	D
2	B	8	D
3	D	9	A
4	A	10	D
5	C	11	C
6	D	12	D

Set-2



GATE - 2005

A 600 mm x 30 mm flat surface of a plate is to be finish machined on a shaper. The plate has been fixed with the 600 mm side along the tool travel direction. If the tool over-travel at each end of the plate is 20 mm, average cutting speed is 8 m/min, feed rate is 0.3 mm/stroke and the ratio of return time to cutting time of the tool is 1:2, the time required for machining will be

(a) 8 minutes (b) 12 minutes

(c) 16 minutes (d) 20 minutes

Ans. (b)

IES - 2004

Consider the following alignment tests on machine tools

1. Straightness 2. Flatness
3. Run out 4. Parallelism

Which of the above alignment tests on machine tools are common to both lathe and shaper?

(a) 1 and 2 (b) 2 and 3

(c) 3 and 4 (d) 1 and 4

Ans. (d)

IES - 2001

In a shaper machine, the mechanism for tool feed is

(a) Geneva mechanism

(b) Whitworth mechanism

(c) Ratchet and Pawl mechanism

(d) Ward- Leonard system

Ans. (c)

IES 2010

Assertion (A): Longitudinal cutting motion of the tool and cross-wise feed motion of the job generates flat surfaces in planning process.

Reason (R): Jobs used in planning machines are generally long and heavy compared to shaping.

(a) Both A and R are individually true and R is the correct explanation of A

(b) Both A and R are individually true but R is NOT the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true **Ans. (d)**

IES - 1997

Which of the following are the advantages of a hydraulic shaper over a mechanically driven shaper?

1. More strokes per minute can be obtained at a given cutting speed.
2. The cutting stroke has a definite stopping point.
3. It is simpler in construction.
4. Cutting speed is constant throughout most of the cutting stroke.

Select the correct answer using the codes given below:

(a) 1 and 2 (b) 1 and 4

(c) 2 and 4 (d) 1, 3 and 4 **Ans. (b)**

Set-2

IES - 1995

In a mechanical shaper, the length of stroke is increased by

(a) Increasing the centre distance of bull gear and crank pin

(b) Decreasing the centre distance of bull gear and crank pin

(c) Increasing the length of the ram

(d) Decreasing the length of the slot in the slotted lever

Ans. (a)

IES - 1994

Given that, average cutting speed = 9 m/min, the return time to cutting time ratio is = 1 : 2, the feed rate = 0.3 mm/stroke, the clearance at each end of cut = 25 mm and that the plate is fixed with 700 mm side along the direction of tool travel, the time required for finishing one flat surface of a plate of size 700 x 30 mm in a shaper, will be

(a) 10 min (b) 12.5 min **Ans. (b)**

(c) 15 min (d) 20 min

IAS - 1995

Size of a shaper is given by

(a) Stroke length (b) Motor power

(c) Weight of the machine (d) Table size

Ans. (a)

IAS - 1994

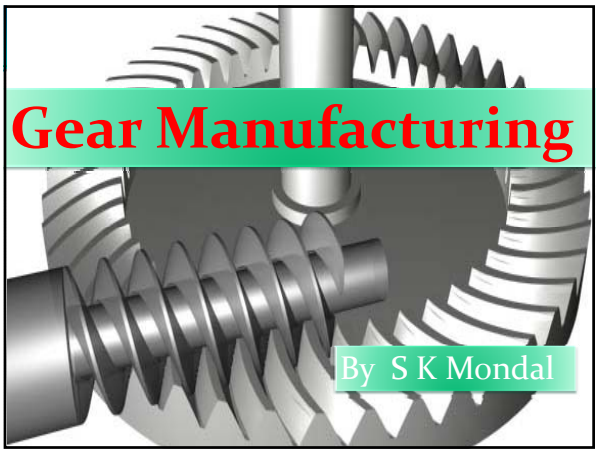
Stroke of a shaping machine is 250 mm. It makes 30 double strokes per minute. Overall average speed of operation is

(a) 3.75 m/min (b) 5.0 m/min

(c) 7.5 m/min (d) 15 m/min

Ans. (d)

Set-2



IES - 1999

Consider the following processes for the manufacture of gears:

1. Casting
2. Powder metallurgy
3. Machining from bar stock
4. Closed die forging

The correct sequence in increasing order of bending strength of gear teeth is

(a) 1, 2, 3, 4 (b) 1, 2, 4, 3
(c) 2, 1, 4, 3 (d) 2, 1, 3, 4 **Ans. (a)**

IES - 2006

Which of the following is/are used for cutting internal gears?

1. Gear hobber 2. Gear shaper
3. Rack cutter 4. Jig borer

Select the correct answer using the codes given below:

(a) Only 1 and 2 (b) Only 2 and 3
(c) Only 1 and 4 (d) Only 2

Ans. (d)

IES - 2005

In helical milling, the ratio of the circumference of the gear blank to the lead of the helix determines the:

(a) Proper speed to use
(b) Proper feed and depth of cut required
(c) Angle setting of the machine table
(d) Gear ratio for table screw and dividing head

Ans. (c)

IES 2010

Match List I with List II and select the correct answer using the code given below the lists: Ans. (d)

List I (Type of work)	**List II (Manufacturing)**
A. High rate production of worm Gears and worm wheel	**1. Gear shaving**
B. Generating internal gears and Cluster gears	**2. Gear milling**
C. Finishing of gear tooth profiles	**3. Gear hobbing**
D. Repair and piece production of gears	**4. Gear shaping**

	A	**B**	**C**	**D**		**A**	**B**	**C**	**D**
(a)	2	1	4	3	(b)	3	1	4	2
(c)	2	4	1	3	(d)	3	4	1	2

IES - 1996

Gear cutting on a milling machine using an involute profile cutter is a

(a) Gear forming process
(b) Gear generating process.
(c) Gear shaping process
(d) Highly accurate gear producing process.

Ans. (a)

Set-2

IES - 2000

Which one of the following processes of gear manufacture results in best accuracy of the involute gear tooth profile?

(a) Milling
(b) Hobbing
(c) Rotary gear shaper
(d) Rack type gear shaper

Ans. (b)

IES - 2009

Assertion (A): Gears produced by employing form-cutting principle using gear-milling cutter on a milling machine are not very accurate.

Reason (R): Production of the correct gear tooth profile employing form-cutting principle would require a separate cutter for cutting different numbers of teeth even for the same module and also errors are associated with inaccurate operation of indexing mechanism.

(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true but R is NOT the correct explanation of A
(c) A is true but R is false
(d) A is false but R is true

Ans. (a)

IES - 1996

Consider the following processes of gear manufacture:

1. Milling with form cutter
2. Rack type gear shaper (gear planer)
3. Rotary gear shaper (gear shaper)
4. Gear hobbing

The correct sequence of these processes in increasing order of accuracy of involute profile of the gear

(a) 3, 2, 4, 1 (b) 2, 3, 4, 1
(c) 3, 2, 1, 4 (d) 2, 3, 1, 4 Ans. (d)

IES - 2009

By which one of the following machines the teeth of an internal spur gear can be cut accurately?

(a) Milling machine
(b) Slotting machine
(c) Hobbing machine
(d) Gear-shaping machine

Ans. (d)

IES - 2004

Gear shaping is a process of manufacturing gears.

Which one of the following principles is employed by it?

(a) Form cutting with cutter
(b) Generating tooth form with a reciprocating cutter
(c) Generating tooth form by a rotating cutter
(d) Generating form with a reciprocating and revolving cutter

Ans. (d)

IES - 1992

In gear hobbing

(a) Only hob rotates
(b) Only gear blank rotates
(c) Both hob and gear blank rotate
(d) Neither hob nor gear blank rotates

Ans. (c)

Set-2

IES - 2003

A spur gear of 40 teeth is machined in a gear hobbing machine using a double start hob cutter. The speed ratio between the hob and the blank is

(a) 1:20 (b) 1:40

(c) 40: 1 (d) 20: 1

Ans. (d)

IES - 2008

Which machining processes are used for gear manufacture?

1. Form milling
2. Broaching
3. Roll forming
4. Hobbing

Select the correct answer using the code given below:

(a) 1, 2 and 3 (b) 1, 3 and 4

(c) 1, 2 and 4 (d) 2, 3 and 4

Ans. (c)

IES - 1999

A 60-teeth gear when hobbed on a differential hobber with a two-start hob, the index change gear ratio is governed by which one of the following kinematic balance equations?

(a) 1 revolution of gear blank = 1/60 of hob revolutions

(b) 1 revolution of gear blank = 2/60 of hob revolutions

(c) 1 revolution of hob = 2/60 of blank revolutions

(d) 1 revolution of hob = 1/60 of blank revolutions

Ans. (c)

IES - 1997

Which of the following motions are needed for spur gear cutting with a hob?

1. Rotary motion of hob
2. Linear axial reciprocator motion of hob
3. Rotary motion of gear blank
4. Radial advancement of hob.

Select the correct answer using the codes given below:

(a) 1, 2 and 3 (b) 1, 3 and 4

(c) 1, 2 and 4 (d) 2, 3 and 4

Ans. (a)

IES - 2007

Which of the following methods are gear generating processes?

1. Gear shaping
2. Gear hobbing
3. Gear milling

Select the correct answer using the code given below:

(a) 1, 2 and 3 (b) 1 and 2 only

(c) 2 and 3 only (d) 1 and 3 only

Ans. (b)

IES - 1993

Internal gear cutting operation can be performed by

(a) Milling

(b) Shaping with rack cutter

(c) Shaping with pinion cutter

(d) Hobbing

Ans. (c)

Set-2

IAS - 1998

Assertion (A): Internal gears are cut on a gear shaper.

Reason (R): Hobbing is not suitable for cutting internal gear.

(a) Both A and R are individually true and R is the correct explanation of A

(b) Both A and R are individually true but R is **not** the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true

Ans. (b)

IES - 2006

Which of the following cannot be cut by hobbing process?

(a) Helical gears (b) Bevel gears

(c) Worm gears (d) Spur gears

Ans. (b)

IES - 1996

For the manufacture of full depth spur gear by hobbing process, the number of teeth to be cut = 30, module = 3 mm and pressure angle = 20°. The radial depth of cut to be employed should be equal to

(a) 3.75 mm (b) 4.50 mm

(c) 6.00 mm (d) 6.75 mm

Ans. (d)

IES - 1995

While cutting helical gears on a non-differential gear hobber, the feed change gear ratio is

(a) Independent of index change gear ratio

(b) dependent on speed change gear ratio

(c) Interrelated to index change gear ratio

(d) Independent of speed and index change gear ratio

Ans. (c)

IES - 1992

Gear burnishing process for

(a) Removing residual stresses from teeth roots

(b) Surface finishing

(c) Under-cut gears

(d) Cycloidal gears

Ans. (b)

IAS - 2003

Which one of the following is not a feature of gear hobbing process?

(a) High rate of production

(b) Generation of helical gears

(c) Very accurate tooth profile

(d) Generation of internal gears

Ans. (d)

Set-2

IAS - 2001

Consider the following motions and setting in a hobbing machine:

1. Hob rotation
2. Job rotation
3. Axial reciprocating hob rotation
4. Tilting of hob to its helix angle

Which of these motions and setting in a hobbing machine are required to machine a spur gear?

(a) 1, 2 and 3 (b) 2, 3 and 4
(c) 1, 2 and 4 (d) 1, 3 and 4 **Ans. (c)**

IES - 1994

Consider the following machine tools:

1. Hobbing machine
2. Gear shaping machine
3. Broaching machine.

The teeth of internal spur gears can be cut in

(a) 1, 2 and 3 (b) 1 and 2
(c) 1 and 3 (d) 2 and 3

Set-2

GATE - 1995

Among the conventional machining processes, maximum specific energy is consumed in

(a) Turning (b) Drilling
(c) Planning (d) Grinding

Ans. (d)

GATE - 1998

Ideal surface roughness, as measured by the maximum height of unevenness, is best achieved when, the material is removed by

(a) An end mill
(b) A grinding wheel
(c) A tool with zero nose radius
(d) A ball mill

Ans. (b)

GATE - 1998

In machining using abrasive material, increasing abrasive grain size

(a) Increases the material removal rate
(b) Decreases the material removal rate
(c) First decreases and then increases the material removal rate
(d) First increases and then decreases the material removal rate

Ans. (d)

GATE - 2000

Abrasive material used in grinding wheel selected for grinding ferrous alloys is

(a) Silicon carbide (b) Diamond
(c) Aluminium oxide (d) Boron carbide

Ans. (c)

GATE - 2002

The hardness of a grinding wheel is determined by the

(a) Hardness of abrasive grains
(b) Ability of the bond to retain abrasives
(c) Hardness of the bond
(d) Ability of the grinding wheel to penetrate the work piece

Ans. (b)

Set-2

GATE - 2004

Typical machining operations are to be performed on hard-to-machine materials by using the processes listed below. Choose the best set of Operation-Process combinations

	Operation		Process
P.	Debarring (internal surface)	1.	Plasma Arc Machining
Q.	Die sinking	2.	Abrasive Flow Machining
R.	Fine hole drilling in thin sheets	3.	Electric Discharge Machining
S.	Tool sharpening	4.	Ultrasonic Machining
		5.	Laser beam Machining
	Ans. (d)	6.	Electrochemical Grinding

(a) P-1 Q-5 R-3 S-4 (b) P-1 Q-4 R-1 S-2

(c) P-5 Q-1 R-2 S-6 (d) P-2 Q-3 R-5 S-6

GATE - 2006

If each abrasive grain is viewed as a cutting tool, then which of the following represents the cutting parameters in common grinding operations?

(a) Large negative rake angle, low shear angle and high cutting speed

(b) Large positive rake angle, low shear angle and high cutting speed

(c) Large negative rake angle, high shear angle and low cutting speed

(d) Zero rake angle, high shear angle and high cutting speed **Ans. (a)**

GATE - 1997

	List I		List II
(A)	Grinding	1.	Surface for oil retention
(B)	Honing	2.	Surface for max. load capacity
(C)	Super-finishing	3.	Surface of limiting friction
D)	Burnishing	4.	Surface of matte finish
		5.	Surface for pressure sealing
		6.	Surface for interference fit.

Ans. (A) -3, (B) -1, (C)-2, (D)-5

IES - 2005

Consider the following statements in respect of grinding?

1. The pitch of the grit cutting edges is larger than the pitch of the milling cutter.
2. The cutting angles of the grits have a random geometry.
3. The size of the chip cuts is very small for grinding.

Which of the statements given above are correct?

(a) 1 and 2 (b) 2 and 3

(c) 1 and 3 (d) 1, 2 and 3 **Ans. (d)**

IES - 2009

Which one of the following is *NOT* used as abrasive material in grinding wheels?

(a) Aluminium oxide

(b) Silicon carbide

(c) Cubic boron nitride

(d) Manganese oxide

Ans. (d)

IES - 1997

Which one of the following materials is used as the bonding material for grinding wheels?

(a) Silicon carbide

(b) Sodium silicate

(c) Boron carbide

(d) Aluminum oxide

Ans. (b)

Set-2

IES - 1996

Grinding wheel is said to be loaded when the

(a) Metal particles get embedded in the wheel surface blocking the interspaces between cutting grains.

(b) Bonding material comes on the surface and the wheel becomes blunt.

(c) Work piece being ground comes to a stop in cylindrical grinding.

(d) Grinding wheel stops because of very large depth of cut

Ans. (a)

IES - 2001

Specific cutting energy is more in grinding process compared to turning because

(a) Grinding (cutting) speed is higher

(b) The wheel has multiple cutting edges (grains)

(c) Plaguing force is significant due to small chip size

(d) Grinding wheel undergoes continuous wear

Ans. (b)

IES - 1996

Specific energy requirements in a grinding process are more than those in turning for the same metal removal rate because of the

(a) Specific pressures between wheel and work being high.

(b) Size effect of the larger contact areas between wheel and work.

(c) High cutting velocities

(d) High heat produced during grinding.

Ans. (d)

IES - 1994

The ratio of thrust force to cutting force is nearly 2.5 in

(a) Turning (b) Broaching

(c) Grinding (d) Plain milling

Ans. (c)

IES - 1992

Assertion (A): Vitrified bond is preferred for thin grinding wheels.

Reason (R): Vitrified bond is hard brittle.

(a) Both A and R are individually true and R is the correct explanation of A

(b) Both A and R are individually true but R is **not** the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true

Ans. (a)

IES - 2000

Assertion (A): The ratio of cutting force to thrust force is very high in grinding process as compared to other machining processes.

Reason (R): Random orientation and effective negative rake angles of abrasive grains increase the cutting force and adversely affect the cutting action and promote rubbing action.

(a) Both A and R are individually true and R is the correct explanation of A

(b) Both A and R are individually true but R is **not** the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true Ans. (d)

Set-2

IES - 1995

Soft materials cannot be economically grind due to

(a) The high temperatures involved
(b) Frequent wheel clogging
(c) Rapid wheel wear
(d) Low work piece stiffness

Ans. (b)

IES 2010

In relation to the peripheral or surface speeds of the grinding wheel and that of the workpiece in cylindrical grinding of alloy steel workpieces, the grinding wheel speed is

(a) Less than the speed of the workpiece
(b) Same as the speed of the workpiece
(c) Double the speed of the workpiece
(d) 65 to 75 times the speed of the workpiece.

Ans. (d)

IES - 2009

Given that the peripheral speed of the grinding wheel of 100 mm diameter for cylindrical grinding of a steel work piece is 30 m/s, what will be the estimated rotational speed of the grinding wheel in revolution per minute (r.p.m.)?

(a) 11460 (b) 5730
(c) 2865 (d) 95

Ans. (b)

IES - 2002

Which of the following materials are used in grinding wheel?

1. Aluminium oxide
2. Cubic boron nitride
3. Silicon carbide

Select the correct answer using the codes given below:

(a) 1, 2 and 3 (b) 1 and 2
(c) 2 and 3 (d) 1 and 3

Ans. (a)

IES - 2001

The marking on a grinding wheel is '51 A 36 L 5 V 93'. The code '36' represents the

(a) Structure
(b) Grade
(c) Grain- size
(d) Manufacturer's number

Ans. (c)

IES - 2000

The sequence of markings "S 14 K 14 S" on a grinding wheel represents respectively

(a) Bond type, structure, grade, grain size and abrasive type
(b) Abrasive type, grain size, grade, structure and bond type
(c) Bond type, grade, structure, grain size and abrasive type
(d) Abrasive type, structure, grade, grain size and bond type

Ans. (b)

Set-2

IES - 1995

In the grinding wheel of A 60 G 7 B 23, B stands for

(a) Resinoid bond (b) Rubber bond

(c) Shellac bond (d) Silicate bond

Ans. (a)

IES - 1993

Tool life in the case of a grinding wheel is the time

(a) Between two successive regrinds of the wheel

(b) Taken for the wheel to be balanced

(c) Taken between two successive wheel dressings

(d) Taken for a wear of 1mm on its diameter

Ans. (c)

IES - 2001

Assertion (A): Hard wheels are chosen for grinding hard metals.

Reason (R): In hard wheels only the abrasive grains are retained for long time.

(a) Both A and R are individually true and R is the correct explanation of A

(b) Both A and R are individually true but R is **not** the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true

Ans. (d)

IES - 1994

Consider the following statements regarding grinding of high carbon steel:

1. Grinding at high speed results in the reduction of chip thickness and cutting forces per grit.
2. Aluminium oxide wheels are employed.
3. The grinding wheel has to be of open structure.

Of these statements

(a) 1, 2 and 3 are correct (b) 1 and 2 are correct

(c) 1 and 3 are correct (d) 2 and 3 are correct

Ans. (b)

IES - 1999

Consider the following reasons:

1. Grinding wheel is soft
2. RPM of grinding wheel is too low
3. Cut is very fine
4. An improper cutting fluid is used

A grinding wheel may become loaded due to reasons stated at

(a) 1 and 4 (b) 1 and 3

(c) 2 and 4 (d) 2 and 3

Ans. (c)

IES - 1993

In centre less grinding, the work piece centre will be

(a) Above the line joining the two wheel centres

(b) Below the line joining the two wheel centres

(c) On the line joining the two wheel centres

(d) At the intersection of the line joining the wheel centres with the work plate plane.

Ans. (a)

Set-2

IES - 2000

Consider the following advantages:

1. Rapid process
2. Work with keyways can be ground
3. No work holding device is required.

Which of these are the advantages of centre less grinding?

(a) 1, 2 and 3 (b) 1 and 2
(c) 2 and 3 (d) 1 and 3

Ans. (d)

IES - 1996

A grinding wheel of 150 mm diameter is rotating at 3000 rpm. The grinding speed is

(a) $7.5\ \pi$ m/s
(b) $15\ \pi$ m/s
(c) $45\ \pi$ m/s
(d) $450\ \pi$ m/s

Ans. (a)

IES - 1993

Consider the following parameters:

1. Grinding wheel diameter.
2. Regulating wheel diameter.
3. Speed of the grinding wheel.
4. Speed of the regulating wheel.
5. Angle between the axes of grinding and regulating wheels.

Among these parameters, those which influence the axial feed rate in centreless grinding would include

(a) 2, 4 and 5 (b) 1, 2 and 3
(c) 1, 4 and 5 (d) 3, 4 and 5 **Ans. (a)**

IES - 2007

Honing Process gives surface finish of what order?

(a) 10 μm (CLA) (b) 1.0 μm (CLA)
(c) 0.1 μm (CLA) (d) 0.01 μm (CLA)

Ans. (c)

IES - 1992

CLA value for Honing process is

(a) 6 (b) 0.05 - 3.0
(c) 0.05 - 1.0 (d) 0.025 - 0.1

Ans. (c)

IES - 2001

Match List-I (Cutting Tools) with List-II (Applications) and select the correct answer using the codes given below the lists:

	List I		List II
A.	Trepanning tool	1.	For surface finishing by honing
B.	Side milling cutter	2.	For machining gears
C.	Hob cutter	3.	For cutting keyways in shafts
D.	Abrasive sticks	4.	For drilling large diameter holes

Ans. (b)

Codes:	**A**	**B**	**C**	**D**		**A**	**B**	**C**	**D**
(a)	1	3	2	4	(b)	4	3	2	1
(c)	1	2	3	4	(d)	4	2	3	1

Set-2

IES - 1992

A surface finish of 0.025 – 0.1 micrometer CLA values is to be produced. Which machining process would you recommend?

(a) Grinding (b) Rough turning
(c) Lapping (d) Honing

Ans. (c)

IES - 1992

Buffing wheels are mode of

(a) Softer metals (b) Cotton fabric
(c) Carbon (d) Graphite

Ans. (b)

IAS - 2004

The size effect refers to the increase in specific cutting energy at low values of undeformed chip thickness. It is due to which one of the following?

(a) Existence of ploughing force
(b) Work hardening
(c) High strain rate
(d) Presence of high friction at chip-tool interface.

Ans. (a)

IAS - 2000

Consider the following statements in respect of a grinding wheel of specification, 51-A- 36-L-7-R-23, using the standard alphanumeric codification:

1. Abrasive used in the wheel is aluminum oxide
2. The grain size of abrasive is medium
3. The wheel grade is medium hard
4. It has an open structure
5. It has resinoid as bonding agent

Which (If these statements are correct?

(a) 1, 2 and 3 (b) 1, 3 and 4
(c) 2, 3 and 5 (d) 1, 4 and 5 **Ans. (a)**

IAS - 1999

Assertion (A): The grade of a grinding wheel is a measure of hardness of the abrasive used for the wheel.

Reason (R): Grading is necessary for making right selection of the wheel for a particular work.

(a) Both A and R are individually true and R is the correct explanation of A

(b) Both A and R are individually true but R is **not** the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true **Ans. (d)**

IAS - 2001

Consider the following statements:

The set-up for internal centreless grinding consists of a regulating wheel, a pressure roll and a support roll, between which the tubular workpiece is supported with the grinding wheel within the tube, wherein

1.The grinding wheel, workpiece and regulating wheel centers must lie on one line

2.The directions of rotation of workpiece and grinding wheel are same

3.The directions of rotation of pressure roll, support roll and regulating wheel are same

4.The directions of rotation of grinding wheel and regulating wheel are same

Which of these statements are correct?

(a) 1, 2 and 3 (b) 1, 3 and 4
(c) 2 and 3 (d) 3 and 4 **Ans. (a)**

Set-2

IAS - 1997

Which of the following pairs are correctly matched?

1. Drill press : Trepanning
2. Centreless grinding: Through feeding
3. Capstan lathe: Ram type turret

Select the correct answer using the codes given below:

Codes:

(a) 1 and 2 (b) 1, 2 and 3

(c) 1 and 3 (d) 2 and 3

Ans. (b)

IAS - 2007

Match List I with List II and select the correct answer using the code given below the Lists:

List I (Machine Tool/ Cutting Tool)		**List II (Part/ Characteristics)**
A. Screw cutting lathe	1.	Self locking taper
B. Drill	2.	Chasing dial
C. End mill	3.	Wiper insert
D. Grinding wheel	4.	Self releasing taper
	5.	Balance weights

Ans. (b)

Code:	**A**	**B**	**C**	**D**		**A**	**B**	**C**	**D**
(a)	4	5	3	1	(b)	2	1	4	5
(c)	4	1	3	5	(d)	2	5	4	1

IAS - 1999

Which one of the following processing sequences will give the best accuracy as well as surface finish?

(a) Drilling, reaming and grinding

(b) Drilling, boring and grinding

(c) Drilling, reaming and lapping

(d) Drilling, reaming and electroplating

Ans. (c)

IAS - 2001

Which one of the following grinding wheels (with Grade, Grit and Bond) is suitable for cutter grinding?

(a) K 60 vitrified (b) K 320 vitrified

(c) T 60 resinoid (d) T 320 resinoid

Ans.(a)

Set-2

GATE - 2006

Arrange the processes in the increasing order of their maximum material removal rate.

Electrochemical Machining (ECM)
Ultrasonic Machining (USM)
Electron Beam Machining (EBM)
Laser Beam Machining (LBM) and
Electric Discharge Machining (EDM)

(a) USM, LBM, EBM, EDM, ECM
(b) EBM, LBM, USM, ECM, EDM
(c) LBM, EBM, USM, ECM, EDM
(d) LBM, EBM, USM, EDM, ECM Ans. (d)

IES - 2007

Consider the following statements in relation to the unconventional machining processes:

1. Different forms of energy directly applied to the piece to have shape transformation or material removal from work surface.
2. Relative motion between the work and the tool is essential.
3. Cutting tool is not in physical contact with work piece.

(a) 1 and 2 only (b) 1, 2 and 3 only
(c) 2 and 3 only (d) 1 and 3 only **Ans. (d)**

IES - 2009

Which one of the following statements is correct in respect of unconventional machining processes?

(a) The cutting tool is in direct contact with the job
(b) The tool material needs to be harder than the job material
(c) The tool is never in contact with the job
(d) There has to be a relative motion between the tool and the job

Ans. (c)

IAS - 2002

Match List I (Processes) with List II (Tolerances obtained) and select the correct answer using the codes given below the Lists:

	List I (Processes)		**List II (Tolerances obtained)**
A.	Plasma Arc machining	1.	7·5 microns
B.	Laser Beam machining	2.	25 microns
C.	Abrasive Jet machining	3.	50 microns
D.	Ultrasonic machining	4.	125 microns **Ans. (c)**

Codes:	**A**	**B**	**C**	**D**		**A**	**B**	**C**	**D**
(a)	4	1	3	2	(b)	3	2	4	1
(c)	4	2	3	1	(d)	3	1	4	2

PSU

ECM cannot be undertaken for
(a) steel
(b) Nickel based superalloy
(c) Al_2O_3
(d) Titanium alloy

- Ans. (c)

Set-2

PSU

Commercial ECM is carried out at a combination of

(a) low voltage high current

(b) low current low voltage

(c) high current high voltage

(d) low current low voltage

Ans. (a)

Example

Using ECM remove 5 cm^3/min from an iron workpiece, what current is required?

Atomic weight of iron 56, density 7.8 g/cm^3 valency, 2

Example

Calculate the material removal rate and the electrode feed rate in the electrochemical machining of an iron surface that is 25 mm × 25 mm in cross-section using NaCl in water as electrolyte. The gap between the tool and the workpiece is 0.25 mm. The supply voltage is 12 V DC. The specific resistance of the electrolyte is 3 Ω cm

For iron, Valency, Z = 2

Atomic weight, A = 55.85

Density, = 7860 kg / m^3

Example (GATE-2009)

Electrochemical machining is performed to remove material from an iron surface of 20 mm x 20 mm under the following conditions:

Inter electrode gap = 0.2 mm

Supply Voltage (DC) = 12 V

Specific resistance of electrolyte = 2Ω cm

Atomic weight of Iron = 55.85

Valency of Iron = 2

Faraday's constant = 96540 Coulombs

The material removal rate (in g/s) is

Example

Composition of a Nickel super-alloy is as follows:

Ni = 70.0%, Cr = 20.0%, Fe = 5.0% and rest Titanium

Calculate rate of dissolution if the area of the tool is 1500 mm^2 and a current of 1000 A is being passed through the cell. Assume dissolution to take place at lowest valancy of the elements.

A_{Ni} = 58.71	ρ_{Ni} = 8.9	v_{Ni} = 2
A_{Cr} = 51.99	ρ_{Cr} = 7.19	v_{Cr} = 2
A_{Fe} = 55.85	ρ_{Fe} = 7.86	v_{Fe} = 2
A_{Ti} = 47.9	ρ_{Ti} = 4.51	v_{Ti} = 3

Example

The electrochemical machining of an iron surface that is 25 mm × 25 mm in cross-section using NaCl in water as electrolyte. The gap between the tool and the workpiece is 0.25 mm. The supply voltage is 12 V DC. The specific resistance of the electrolyte is 3 Ωcm.

Estimate the electrolyte flow rate. Specific heat of the electrolyte is given as 0.997 cal/g°C. The ambient temperature is 35°C and the electrolyte boiling temperature, is 95°C.

Density, = 7860 kg/m^3

Set-2

Example

In ECM operation of pure iron an equilibrium gap of 2 mm is to be kept. Determine supply voltage, if the total overvoltage is 2.5 V. The resistivity of the electrolyte is 50 Ω-mm and the set feed rate is 0.25 mm/min.

IES - 2000

Consider the following statements:
In electrochemical grinding,

1. A rubber bonded alumina grinding wheel acts as the cathode and the workplace as the anode.
2. A copper bonded alumina grinding wheel acts as the cathode and the work piece as the anode.
3. Metal removal takes place due to the pressure applied by the grinding wheel.
4. Metal removal takes place due to electrolysis.

Which of these statements are correct?

(a) 1 and 3 (b) 2 and 4
(c) 2 and 3 (d) 1 and 3 **Ans. (b)**

GATE - 2008

A researcher conducts electrochemical machining (ECM) on a binary alloy (density 6000 kg/m³) of iron (atomic weight 56, valency 2) and metal P (atomic weight 24, valency 4). Faraday's constant = 96500 coulomb/mole. Volumetric material removal rate of the alloy is 50 mm³/s at a current of 2000 A. The percentage of the metal P in the alloy is closest to

(a) 40 (b) 25 (c) 15 (d) 79 **Ans. (b)**

GATE - 2001

In ECM, the material removal is due to

(a) Corrosion
(b) Erosion
(c) Fusion
(d) Ion displacement

Ans. (d)

GATE - 1997

Selection electrolyte for ECM is as follows:

(a) Non-passivating electrolyte for stock removal and passivating electrolyte for finish control
(b) Passivating electrolyte for stock removal and non-passivating electrolyte for finish control
(c) Selection of electrolyte is dependent on current density
(d) Electrolyte selection is based on tool- work electrodes

Ans. (d)

GATE - 1992

The two main criteria for selecting the electrolyte in Electrochemical Machining (ECM) is that the electrolyte should

(a) Be chemically stable
(b) Not allow dissolution of cathode material
(c) Not allow dissolution of anode material
(d) Have high electrical conductivity

Ans. (a, d)

Set-2

GATE - 1997

Inter electrode gap in ECG is controlled by

(a) Controlling the pressure of electrolyte flow
(b) Controlling the applied static load
(c) Controlling the size of diamond particle in the wheel
(d) Controlling the texture of the work piece

Ans. (c)

IES - 2002

Assertion (A): In ECM, the shape of the cavity is the mirror image of the tool, but unlike EDM, the tool wear in ECM is less.

Reason (R): The tool in ECM is a cathode.

(a) Both A and R are individually true and R is the correct explanation of A
(b) Both A and R are individually true but R is **not** the correct explanation of A
(c) A is true but R is false
(d) A is false but R is true **Ans. (d)**

IES - 1997

Which one of the following processes does not cause tool wear?

(a) Ultrasonic machining
(b) Electrochemical machining
(c) Electric discharge machining
(d) Anode mechanical machining

Ans. (b)

IES 2011 Conventional

Discuss the effects of insufficient dielectric and electrolyte circulation in the inter-electrode gap on the Electric Discharge machining and Electro Chemical Machining process respectively. [5 Marks]

IES 2009 Conventional

i. What is the principle of metal removal in EDM process?
ii. Describe the process with the help of sketch.
iii. List advantages and limitations of the system.

[15 marks]

GATE - 1994

Electric discharge machining is more efficient process than Electrochemical machining for producing large non-circular holes.

The above statement is

(a) True
(b) False
(c) Cant say
(d) Insufficient data

Ans. (a)

Set-2

GATE - 2004

The mechanism of material removal in EDM process is

(a) Melting and Evaporation
(b) Melting and Corrosion
(c) Erosion and Cavitation
(d) Cavitation and Evaporation

Ans. (a)

GATE - 2003

As tool and work are not in contact in EDM process

(a) No relative motion occurs between them
(b) No wear of tool occurs
(c) No power is consumed during metal cutting
(d) No force between tool and work occurs

Ans. (d)

GATE - 1999

In Electro-Discharge Machining (EDM), the tool is made of

(a) Copper (b) High Speed Steel
(c) Cast Iron (d) Plain Carbon Steel

Ans. (a)

GATE - 2007

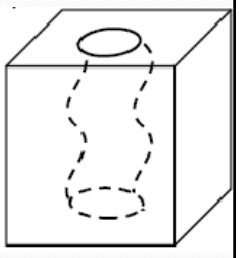
In electro discharge machining (EDM), if the thermal conductivity of tool is high and the specific heat of work piece is low, then the tool wear rate and material removal rate are expected to be respectively

(a) High and high (b) Low and low
(c) High and low (d) Low and high

Ans. (d)

GATE - 2005

A zigzag cavity in a block of high strength alloy is to be finish machined. This can be carried out by using



(a) Electric discharge machining
(b) Electro-chemical machining
(c) Laser beam machining
(d) Abrasive flow machining

Ans. (a)

IES - 2005

Which of the following is/are used as low wearing tool material(s) in electric discharge machining?

(a) Copper and brass
(b) Aluminium and graphite
(c) Silver tungsten and copper tungsten
(d) Cast iron

Ans. (c)

Set-2

GATE- 2000

Deep hole drilling of small diameter, say 0.2 mm is done with EDM by selecting the tool material as

(a) Copper wire (b) Tungsten wire
(c) Brass wire (d) Tungsten carbide

Ans. (b)

GATE - 1994

Ultrasonic machining is about the best process for making holes in glass which are comparable in size with the thickness of the sheet.

The above statement is

(a) True
(b) False
(c) Cant say
(d) Insufficient data

Ans. (a)

IES 2011

USM has good machining performance for :

(a) Al
(b) Steel
(c) Super alloys
(d) Refractory material

Ans. (d)

GATE - 1993

In ultrasonic machining process, the material removal rate will be higher for materials with

(a) Higher toughness (b) Higher ductility
(c) Lower toughness (d) Higher fracture strain

Ans. (c)

GATE - 1992

In Ultrasonic Machining (USM) the material removal rate would

(a) Increase
(b) Decrease
(c) Increase and then decrease
(d) decrease and then increase

with increasing mean grain diameter of the abrasive material.

Ans. (c)

IES - 2009

By which one of the following processes the metering holes in injector nozzles of diesel engines can be suitably made?

(a) Ultrasonic machining
(b) Abrasive jet machining
(c) Electron beam machining
(d) Chemical machining

Ans. (b)

Set-2

IES - 2006

During ultrasonic machining, the metal removal is achieved by

(a) High frequency eddy currents
(b) high frequency sound waves
(c) Hammering action of abrasive particles
(d) Rubbing action between tool and workpiece

Ans. (c)

IAS - 1996

During ultrasonic machining, the metal removal is affected by the

(a) Hammering action of abrasive particles
(b) Rubbing action between tool and workpiece
(c) High frequency sound waves
(d) High frequency eddy currents

Ans. (c)

GATE - 1992

Match the following components with the appropriate machining processes:

Component		**Process**	
(A)	Square hole in a high strength alloy	(1)	Milling
(B)	Square hole in a ceramic component	(2)	Drilling
(C)	Blind holes in a die	(3)	ECM
(D)	Turbine blade profile on high strength alloy	(4)	Jig boring
	Ans. (b)	(5)	EDM
		(6)	USM

Codes:	**A**	**B**	**C**	**D**		**A**	**B**	**C**	**D**
(a)	4	1	2	3	(b)	5	6	1	3
(c)	4	2	1	3	(d)	3	1	2	4

GATE 2011

Match the following non – traditional machining processes with the corresponding material removal mechanism:

Machining process	***Mechanism of material removal***
P. Chemical machining	1. Erosion
Q. Electro – chemical machining	2. Corrosive reaction
R. Electro – discharge machining	3. Ion displacement
S. Ultrasonic machining	4. Fusion and vaporization

(a) P – 2, Q – 3, R – 4, S – 1 (b) P – 2, Q – 4, R – 3, S – 1
(c) P – 3, Q – 2, R – 4, S – 1 (d) P – 2, Q – 3, R – 1, S – 4
Ans. (a)

GATE - 2007

Match the most suitable manufacturing processes for the following parts.

Parts		**Manufacturing Processes**	
P.	Computer chip	1.	Electrochemical Machining
Q.	Metal forming dies and moulds	2.	Ultrasonic Machining
R.	Turbine blade	3.	Electro-discharge Machining **Ans. (a)**
S.	Glass	4.	Photochemical Machining

Codes:	**P**	**Q**	**R**	**S**		**P**	**Q**	**R**	**S**
(a)	4	3	1	2	(b)	4	3	2	1
(c)	3	1	4	2	(d)	1	2	4	3

GATE - 1998

List I	**List II**	
(A) ECM	(1)	Plastic shear
(B) EDM	(2)	Erosion/Brittle fracture
(C) USM	(3)	Corrosive reaction
(D) LBM	(4)	Melting and vaporization
	(5)	Ion displacement **Ans. (b)**
	(6)	Plastic shear and ion displacement

Codes:	**A**	**B**	**C**	**D**		**A**	**B**	**C**	**D**
(a)	4	1	2	3	(b)	5	4	2	4
(c)	4	2	1	3	(d)	3	1	2	4

Set-2

IES - 2008

Match List-I with List-II and select the correct answer using the code given below the lists:

	List-I (Unconventional machining process)		List-II (Basic process)
A.	Electro polishing	1.	Thermal
B.	Electrochemical machining	2.	Mechanical
C.	Abrasive jet machining	3.	Electrochemical
D.	Electrical discharge machining	4.	Chemical

Ans. (a)

Code:	A	B	C	D		A	B	C	D
(a)	4	3	2	1	(b)	2	1	4	3
(c)	4	1	2	3	(d)	2	3	4	1

IES - 1998

Match List-I (Machining process) with List-II (Associated medium) and select the correct answer using the codes given below the lists:

	List-I		List-II
A.	Ultrasonic machining	1.	Kerosene
B.	EDM	2.	Abrasive slurry
C.	ECM	3.	Vacuum
D.	EBM	4.	Salt solution

Ans. (b)

Code:	A	B	C	D		A	B	C	D
(a)	2	3	4	1	(b)	2	1	4	3
(c)	4	1	2	3	(d)	4	3	2	1

IES - 2005

Match List I (Machining Process) with List II (Application) and select the correct answer using the code given below the Lists:

	List I		List II
A.	EDM	1.	Holes & cavities in hard & brittle materials
B.	LBM	2.	Micro-drilling & micro-welding of materials
C.	USM	3.	Shaping of hard metals or reshaping of cemented carbide tools
D.	ECM	4.	Shaping of cemented carbide dies and punches

Ans. (c)

Codes:	A	B	C	D		A	B	C	D
(a)	4	1	2	3	(b)	3	2	1	4
(c)	4	2	1	3	(d)	3	1	2	4

IES - 2003

Match List I (Materials) with List II (Machining) and select the correct answer using the codes given below the Lists:

	List I (Materials)		List II (Machining)
A.	Machining of conducting materials	1.	ECM
B.	Ruby rod	2.	EDM
C.	Electrolyte	3.	USM
D.	Abrasive slurry	4.	LBM

Ans. (d)

Codes:	A	B	C	D		A	B	C	D
(a)	4	2	1	3	(b)	4	2	3	1
(c)	2	4	3	1	(d)	2	4	1	3

IES - 2003

Assertion (A): Water jet machining uses high pressure and high velocity water stream which acts like a saw and cuts a narrow groove in the material.

Reason (R): The force required for cutting is generated from sudden change in the momentum of the water stream.

(a) Both A and R are individually true and R is the correct explanation of A

(b) Both A and R are individually true but R is **not** the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true **Ans. (a)**

IAS - 2002

Which one of the following pairs is NOT correctly matched?

(Unconventional machining method) (Application)

(a) Electric discharge : Machining of electrically conductive materials

(b) Laser beam : Micromachining

(c) Plasma arc : Faster cutting of hard materials

(d) Electron beam : Faster metal removal rate

Ans. (d)

Set-2

IAS - 1999

Match List I (Unconventional machining process) with List II (Typical application) and select the correct answer using the codes given below the lists:

	List I	List II	Ans. (d)
A.	Electro discharge machining	1.	Drilling micro holes in very hard metals
B.	Electro chemical machining	2.	Drilling holes in glass
C.	Ultrasonic machining	3.	Die sinking
D.	Laser beam machining	4.	Machining contours

Codes:	A	B	C	D		A	B	C	D
(a)	4	2	3	1	(b)	3	4	1	2
(c)	4	3	2	1	(d)	3	4	2	1

IES - 2004

Match List I (Machining processes) with List II (Operating media) and select the correct answer using the codes given below the Lists:

	List I	List II	
A.	Abrasive jet machining	1.	Dielectric
B.	Electron beam machining	2.	Electrolyte
C.	Electro-chemical machining	3.	Abrasive slurry
D.	Electro-discharge machining	4.	Vacuum
		5.	Air

Ans. (a)

Codes:	A	B	C	D		A	B	C	D
(a)	5	4	2	1	(b)	4	5	2	1
(c)	4	2	3	5	(d)	2	5	3	4

IES - 1999

Match List-I with List-II and select the correct answer using the codes given below the Lists:

	List-I	List-II
A.	Die sinking	1. Abrasive jet machining
B.	Debarring	2. Laser beam machining
C.	Fine hole drilling (thin materials)	3. EDM
D.	Cutting/sharpening hard materials	4. Ultrasonic machining
		5. Electrochemical grinding

Ans. (c)

Code:	A	B	C	D		A	B	C	D
(a)	3	5	4	1	(b)	2	4	1	3
(c)	3	1	2	5	(d)	4	5	1	3

GATE - 2004

Typical machining operations are to be performed on hard-to-machine materials by using the processes listed below. Choose the best set of Operation-Process combinations

	Operation		Process
P.	Debarring (internal surface)	1.	Plasma Arc Machining
Q.	Die sinking	2.	Abrasive Flow Machining
R.	Fine hole drilling in thin sheets	3.	Electric Discharge Machining
S.	Tool sharpening	4.	Ultrasonic Machining
		5.	Laser beam Machining
		6.	Electrochemical Grinding

(a)	P-1 Q-5 R-3 S-4	(b)	P-1 Q-4 R-1 S-2
(c)	P-5 Q-1 R-2 S-6	(d)	P-2 Q-3 R-5 S-6

Ans. (d)

Ch-10: Non-Conventional Machining Operation

Q. No	Option	Q. No	Option
1	D	8	D
2	B	9	A
3	B	10	B
4	D	11	D
5	D	12	A
6	B	13	A
7	A	14	B

NC, CNC & Robotics

By S K Mondal

IAS - 1996

Assertion (A): The temperature control of an electric iron is an example of servomechanism.

Reason (R): It is an automatic control system.

(a) Both A and R are individually true and R is the correct explanation of A

(b) Both A and R are individually true but R is **not** the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true

Ans. (d)

GATE - 1994

CNC machines are more accurate than conventional machines because they have a high resolution encoder and digital read-outs for positioning.

True or false?

Ans. True

IES - 1999

Consider the following statements regarding numerically controlled machine tools:

1. They reduce non-productive time
2. They reduce fixturing
3. They reduce maintenance cost

Which of these statements are correct?

(a) 1, 2 and 3 (b) 1 and 2

(c) 2 and 3 (d) 1 and 3

Ans. (b)

IES - 1995

Consider the following characteristics of production jobs:

1. Processing of parts frequently in small lots
2. Need to accommodate design changes of products.
3. Low rate of metal removal
4. Need for holding close tolerances

The characteristics which favour the choice of numerically controlled machines would include

(a) 1, 2 and 3 (b) 2, 3 and 4

(c) 1, 3 and 4 (d) 1, 2 and 4 **Ans. (d)**

IES - 2009

In which of the following machining manual part programming is done?

(a) CNC machining (b) NC machining

(c) DNC machining (d) FMS machining

Ans. (b)

Set-2

GATE - 1993

With reference to NC machine, which of the following statement is wrong?

(a) Both closed-loop and open-loop control systems are used

(b) Paper tapes, floppy tapes and cassettes are used for data storage

(c) Digitizers may be used as interactive input devices

(d) Post processor is an item of hardware

Ans. (c)

IES - 2007

What are the main components of an NC machine?

1. Part program
2. Machine Control Unit
3. Servo motor

Select the correct answer using the code given below:

(a) 1, 2 and 3 (b) 1 and 2 only

(c) 2 and 3 only (d) 1 and 3 only

Ans. (a)

JWM 2010

Consider the following components regarding numerical control system :

1. Programme of instructions
2. Machine control unit
3. Processing equipment

Which of these are correct ?

(a) 1, 2 and 3 (b) 1 and 2 only

(c) 2 and 3 only (d) 1 and 3 only

Ans. (a)

IES - 2009

What is the purpose of satellite computers in Distributed Numerical Control machines?

(a) To act as stand-by systems

(b) To share the processing of large-size NC programs

(c) To serve a group of NC machines

(d) To network with another DNC setup

Ans. (c)

IES - 1999

Consider the following components:

1. A dedicated computer
2. Bulk memory
3. Telecommunication lines

Which of these components are required for a DNC system?

(a) 2 and 3 (b) 1 and 2

(c) 1, 2 and 3 (d) 1 and 3

Ans. (c)

JWM 2010

Consider the following advantages of DNC systems :

1. Time-sharing

2. Greater computational capability

3. Remote computer location

Which of the above is/are correct ?

(a) 1 and 2 only (b) 2 and 3 only

(c) 2 only (d) 1, 2 and 3

And. (d)

Set-2

IES – 2002 S-1

Match List I with List II and select the correct answer:

List I (NC machine tool systems)		List II (Features)
A. NC system	1.	It has an integrated automatic tool changing unit and a component indexing device
B. CNC system	2.	A number of machine tools are controlled by a computer. No tape reader, the part program is transmitted directly to the machine tool from the computer memory
C. DNC system	3.	The controller consists of soft-wired computer and hard- wired logic Graphic display of tool path is also possible
D. Machining centre	4.	The instructions on tape is prepared in binary decimal form and operated by a series of coded instructions

Ans. (c)

Codes:	A	B	C	D		A	B	C	D
(a)	4	2	3	1	(b)	1	3	2	4
(c)	4	3	2	1	(d)	1	2	3	4

GATE - 2007

Which type of motor is NOT used in axis or spindle drives of CNC machine tools?

(a) Induction motor (b) DC servo motor

(c) Stepper motor (d) Linear servo motor

Ans. (a)

IES - 1994

Feed drives in CNC milling machines are provided by

(a) Synchronous motors

(b) Induction motors

(c) Stepper motors

(d) Servo-motors.

Ans. (d)

IES - 2002

In a CNC machine tool, encoder is used to sense and control

(a) Table position

(b) Table velocity

(c) Spindle speed

(d) Coolant flow

Ans. (b)

Example

- **A DC servomotor is coupled directly to a leadscrew which drives the table of an NC machine tool. A digital encoder, which emits 500 pulses per revolution, is mounted on the other end of the leadscrew. If the leadscrew pitch is 5 mm and the motor rotates at 600 rpm, calculate**

(a) The linear velocity of the table

(b) The BLU of the NC system

(c) The frequency of pulses transmitted by the encoder.

Set-2

IES 2011 Conventional

- The table of a CNC machine is driven by a Lead screw which is rotated by a DC servomotor. A digital encoder which emits 1000 pulses per second is mounted on the lead screw as a feedback device. If the lead screw pitch is 6 mm and motor rotates at 500 rpm, find
  1. Basic length Units of the system
  2. Linear velocity of the table.
  3. Frequency of pulses generated by the feedback device.

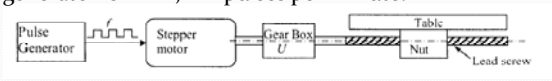
[5 Marks]

Statement for Linked Answers questions: S-1

In the feed drive of a Point-to-Point open loop CNC drive, a stepper motor rotating at 200 steps/rev drives a table through a gear box and lead screw-nut mechanism (pitch = 4 mm, number of starts = 1).

The gear ratio = $\frac{\text{Output rotational speed}}{\text{Input rotational speed}}$ is given by U = $\frac{1}{4}$

The stepper motor (driven by voltage pulses from a pulse generator) executes 1 step/pulse of the pulse generator. The frequency of the pulse train from the pulse generator is f = 10,000 pulses per minute.



GATE – 2008 Q-1 (Statement in S-1)

The Basic Length Unit (BLU), i.e., the table movement corresponding to 1 pulse of the pulse generator, is

(a) 0.5 microns (b) 5 microns
(c) 50 microns (d) 500 microns

Ans. (b)

GATE – 2008 Q-2 (Statement in S-1)

A customer insists on a modification to change the BLU of the CNC drive to 10 microns without changing the table speed. The modification can be accomplished by

(A) Changing U to $\frac{1}{2}$ and reducing f to $\frac{f}{2}$

(B) Changing U to $\frac{1}{8}$ and increasing f to 2f

(C) Changing U to $\frac{1}{2}$ and keeping f unchanged

(D) Keeping U unchanged and increasing f to 2f

Ans. (a)

GATE - 1997

In a point to point control NC machine, the slides are positioned by an integrally mounted stepper motor drive. If the specification of the motor is 1°/pulse, and the pitch of the lead screw is 3.6 mm, what is the expected positioning accuracy?

(*a*) 1 μm (*b*) 10 μm
(*c*) 50 μm (*d*) 100 μm

Ans. (b)

GATE - 1992

In a point-to-point type of NC system

(a) Control of position and velocity of the tool is essential
(b) Control of only position of the tool is sufficient
(c) Control of only velocity of the tool is sufficient
(d) Neither position nor velocity need be controlled

Ans. (b)

Set-2

GATE - 2006

NC contouring is an example of

(a) Continuous path positioning
(b) Point-to-point positioning
(c) Absolute positioning
(d) Incremental positioning

Ans. (a)

GATE-2005

Which among the NC operations given below are continuous path operations?

Arc Welding (AW) Milling (M)
Drilling (D) Punching is Sheet Metal (P)
Laser Cutting of Sheet Metal (LC) Spot Welding (SW)

(a) AW, LC and M (b) AW, D, LC and M
(c) D, LC, P and SW (d) D, LC, and SW

Ans. (a)

IES - 2000

Assertion (A): The axis of an NC drilling machine spindle is denoted as z-axis.

Reason (R): In NC machine tool, the axis perpendicular to both x- and y-axis is designated as z-axis

(a) Both A and R are individually true and R is the correct explanation of A
(b) Both A and R are individually true but R is **not** the correct explanation of A
(c) A is true but R is false
(d) A is false but R is true **Ans. (a)**

IES - 1996

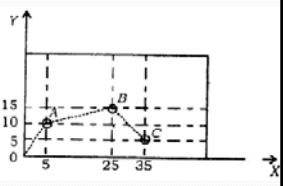
Assertion (A): Numerically controlled machines having more than three axes do not exist.

Reason (R): There are only three Cartesian coordinates namely x-y-z.

(a) Both A and R are individually true and R is the correct explanation of A
(b) Both A and R are individually true but R is **not** the correct explanation of A
(c) A is true but R is false
(d) A is false but R is true **Ans. (d)**

IES - 2003 S-1

While part programming in CNC machines, the input of dimensional information for the tool path can be given in the absolute co-ordinate system or in incremental co-ordinate system. The above figure shows the route to be followed by the tool from O to C, i.e., O - A - B - C.



IES – 2003 Contd.. From S-1

If incremental co-ordinates system is used, the co-ordinates of each point A, B and C are

(a) A: X 5.0, Y 10.0
B: X 20.0, Y5.0
C: X 10.0, Y 10.0

(b) A: X 5.0, Y 10.0
B: X 25, Y 15.0
C: X 35, Y 5.0

(c) A: X 10.0, Y 5.0
B: X 15.0, Y 25.0
C: X 15.0, Y 35.0

(d) A: X 10.0, Y 5.0
B: X 5.0, Y 20.0
C: X 10.0, Y 10.0

Ans. (a)

Set-2

GATE - 2004

During the execution of a CNC part program block N020 G02 X45.0 Y25.0 R5.0 the type of tool motion will be

(a) Circular Interpolation – clockwise
(b) Circular Interpolation - counter clockwise
(c) Linear Interpolation
(d) Rapid feed

Ans. (a)

GATE - 2010

In a CNC program block, N002 G02 G91 X40 Z40..., G02 and G91 refer to

(a) Circular interpolation in counterclockwise direction and incremental dimension
(b) Circular interpolation in counterclockwise direction and absolute dimension
(c) Circular interpolation in clockwise direction and incremental dimension
(d) Circular interpolation in clockwise direction and absolute dimension

IES - 2009

Interpolation in the controller refers to control of which one of the following in a CNC machine?

(a) Loading/unloading of jobs on machine
(b) Loading/unloading of tools from the tool changer
(c) Axes of machine for contouring
(d) Coolant and miscellaneous functions on machine

Ans. (c)

GATE - 2001

In an NC machining operation, the tool has to be moved from point (5, 4) to point (7, 2) along a circular path with centre at (5, 2). Before starting the operation, the tool is at (5, 4). The correct G and M code for this motion is

(a) N010 G03 X7.0 Y2.0 I5.0 J2.0
(b) N010 G02 X7.0 Y2.0 I5.0 J2.0
(c) N010 G01 X7.0 Y2.0 I5.0 J2.0
(d) N010 G00 X7.0 Y2.0 I5.0 J2.0

Ans. (b)

GATE - 2005

The tool of an NC machine has to move along a circular arc from (5, 5) to (10,10) while performing an operation. The centre of the arc is at (10, 5). Which one of the following NC tool path commands performs the above mentioned operation?

(a) N010G02 X10 Y10 X5 Y5 R5
(b) N010G03 X10 Y10 X5 Y5 R5
(c) N010G01 X5 Y5 X10 Y10 R5
(d) N010G02 X5 Y5 X10 Y10 R5

Ans. (d)

GATE - 2000

In finish machining of an island on a casting with CNC milling machine, an end mill with 10 mm diameter is employed. The corner points of the island are represented by (0, 0), (0, 30), (50, 30), and (50, 0). By applying cutter radius right compensation, the trajectory of the cutter will be

(a) (-5, 0), (-5, 35), (55, 35), (55, -5), (-5, -5)
(b) (0, -5), (55, -5), (55, 35), (-5, 35), (-5, -5)
(c) (5, 5), (5, 25), (45, 25), (45, 5), (5, 5)
(d) (5, 5), (45, 5), (45, 25), (5, 25), (5, 5)

Ans. (b)

Set-2

GATE - 2009

Match the following:

NC Code	Definition
P. M05	1. Absolute coordinate system
Q. G01	2. Dwell
R. G04	3. Spindle stop
S. G90	4. Linear interpolation

(a) P-2,Q-3,R-4,S-1 (b) P-3,Q-4,R-1, S-2
(c) P-3,Q-4,R-2,S-1 (d) P-4,Q-3,R-2,S-1

- **Ans. (c)**

IES - 1993

A 'block' of information in N.C. machine program means

(a) One row on tape
(b) A word comprising several rows on tape
(c) One complete instruction
(d) One complete program for a job

Ans. (c)

IES - 1996

In manual programming and tape preparation for a NC drilling machine, the spindle speed was coded as S 684 (using the magic-three code). The spindle speed in rpm will be

(a) 684
(b) 68.4
(c) 840
(d) 6840

Ans. (a)

IES - 1995

Match List I with List II and select the correct answer using the codes given below the lists:

List I (A function connected with NC m/c tool)	List II (Associated parameter)
A. Interpolation	1. Tape preparation
B. Parity check	2. Canned cycle
C. Preparatory function	3. Drilling
D. Point to point control	4. Contouring
	5. Turning

Code:	A	B	C	D		A	B	C	D
(a)	4	1	2	3	(b)	4	1	2	5
(c)	5	1	3	2	(d)	1	4	3	2

Ans. (a)

IES - 1998

Which of the following are the rules of programming NC machine tools in APT language?

1. Only capital letters are used
2. A period is placed at the end of each statement
3. Insertion of space does not affect the APT word

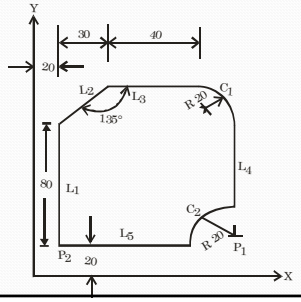
Select the correct answer using the codes given below:

(a) 1 and 2 (b) 2 and 3
(c) 1 and 3 (d) 1 alone

Ans. (d)

IES-2008

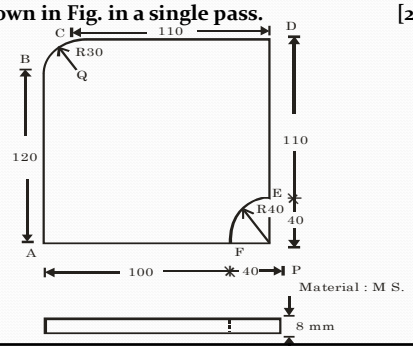
Name the four types of statements in a complete APT part program. Prepare part program for geometry description of the contour shown in the figure below: [15-Marks]



Set-2

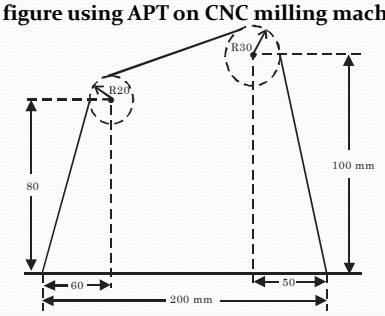
IES-2007

Prepare part using APT language for milling the contour shown in Fig. in a single pass. [20-Marks]



IES-2006

Prepare part program to machine the contour shown in the figure using APT on CNC milling machine. [15-Marks]



Material: MS Thickness: 8.0 mm

IES 2011 Conventional

State the method of defining line segment of cutter motion using APT program format.

[5 Marks]

IES - 1997

Which of the following are valid statements for point to point motion of the tool in APT language?

1. GO/TO/.....
2. GO DLTA/.....
3. GO/TO, ...

Select the correct answer using the codes given below:

(a) 1 and 2 (b) 2 and 3

(c) 1 and 3 (d) 1, 2 and 3

Ans. (c)

IES - 1995

In APT language, the cutter motion in incremental coordinate mode is addressed as

(a) GO/TO/.....

(b) GO/TO.....

(c) GO DLTA/....

(d) GO FWD/...

Ans. (c)

IES 2011

Trajectory of a robot mean :

(a) Path traced by the end effectors

(b) Kinematics of Robot

(c) Robot joints

(d) Robot programming

Ans. (a)

Set-2

IES 2010

Consider the following statements:

Good dynamic performance is usually difficult to achieve in robots which contain a rotary base because

1. Position, speed and acceleration of the other joints cause variations in the reflected torque and moment of inertia.
2. The moment of inertia reflected at the base depends upon the weight of the object being carried.
3. The moment of inertia reflected at the base also depends upon the distance between the base axis and the manipulated object.

Which of the above statements is/are correct?

(a) 1, 2 and 3 (b) 2 and 3 only
(c) 1 only (d) 1 and 3 only **Ans. (b)**

IES - 2006

Which one of the following is the third basic component of robots besides power supply and control (memory) console?

(a) Software (b) Coaxial cable
(c) Mechanical unit arm (d) Microcomputer

Ans. (c)

IES - 2000

Consider the following characteristics of a robot:

1. The tip of the robot arm moves from one point to another with its in-between path not being defined.
2. It can be used for drilling holes at difference points in a workpiece.
3. It can be used for V butt joint welding between two points.
4. The memory capacity required for its control unit is low.

Which of these are the characteristics associated with a point to point robot?

(a) 1 and 2 (b) 1, 3 and 4
(c) 1, 2 and 4 (d) 2, 3 and 4 **Ans. (c)**

IES - 2006

Which item best describes a CAM technology?

(a) Geometric modeling (b) Documentation
(c) Drafting (d) Numerical control

Ans. (d)

IES - 1996

Which of the following pairs are correctly matched?

1. CNC machine..... Post processor
2. Machining centre....Tool magazine
3. DNC..... FMS

(a) 1, 2 and 3 (b) 1 and 2
(c) 1 and 3 (d) 2 and 3

Ans. (a)

IES - 2006

Flexible manufacturing allows for:

(a) Tool design and production
(b) Automated design
(c) Quick and inexpensive product change
(d) Quality control

Ans. (c)

IES - 2004

Consider the following characteristics:

1. Single machine tool
2. Manual materials handling system
3. Computer control
4. Random sequencing of parts to machines

Which of the above characteristics are associated with flexible manufacturing system?

(a) 1, 2 and 3 (b) 1 and 2

(c) 3 and 4 (d) 2, 3 and 4

Ans. (a)

Set-2

GATE - 2001

Allowance in limits and fits refers to

(a) Maximum clearance between shaft and hole

(b) Minimum clearance between shaft and hole

(c) Difference between maximum and minimum size of hole

(d) Difference between maximum and minimum size of shaft

Ans. (b)

GATE - 1998

In the specification of dimensions and fits,

(a) Allowance is equal to bilateral tolerance

(b) Allowance is equal to unilateral tolerance

(c) Allowance is independent of tolerance

(d) Allowance is equal to the difference between maximum and minimum dimension specified by the tolerance.

Ans. (c)

GATE - 2010

A shaft has a dimension, $\phi 35^{-0.009}_{-0.025}$

The respective values of fundamental deviation and tolerance are

(a) $-0.025, \pm 0.008$ (b) $-0.025, 0.016$

(c) $-0.009, \pm 0.008$ (d) $-0.009, 0.016$

Ans. (d)

GATE - 1992

Two shafts A and B have their diameters specified as 100 ± 0.1 mm and 0.1 ± 0.0001 mm respectively.

Which of the following statements is/are true?

(a) Tolerance in the dimension is greater in shaft A

(b) The relative error in the dimension is greater in shaft A

(c) Tolerance in the dimension is greater in shaft B

(d) The relative error in the dimension is same for shaft A and shaft B

Ans. (a)

GATE - 2004

In an interchangeable assembly, shafts of size $25.000^{+0.040}_{-0.010}$ **mm mate with holes of size** $25.000^{+0.020}_{-0.000}$ **mm. The maximum possible clearance in the assembly will be**

(a) 10 microns

(b) 20 microns

(c) 30 microns

(d) 60 microns

Ans. (c)

Set-2

GATE - 2007

A hole is specified as $40^{+0.050}_{+0.000}$ mm. The mating shaft has a clearance fit with minimum clearance of 0.01 mm. The tolerance on the shaft is 0.04 mm. The maximum clearance in mm between the hole and the shaft is

(a) 0.04
(b) 0.05
(c) 0.10
(d) 0.11

Ans. (c)

IES - 2005

The tolerance specified by the designer for the diameter of a shaft is 20.00 ± 0.025 mm. The shafts produced by three different machines A, B and C have mean diameters of 19·99 mm, 20·00 mm and 20.01 mm respectively, with same standard deviation. What will be the percentage rejection for the shafts produced by machines A, B and C?

(a) Same for the machines A, Band C since the standard deviation is same for the three machines
(b) Least for machine A
(c) Least for machine B
(d) Least for machine C

Ans. (c)

IES 2011

Interference fit joints are provided for:

(a) Assembling bush bearing in housing
(b) Mounting heavy duty gears on shafts
(c) Mounting pulley on shafts
(d) Assembly of flywheels on shafts

Ans. (a)

GATE - 2005

In order to have interference fit, it is essential that the lower limit of the shaft should be

(a) Greater than the upper limit of the hole
(b) Lesser than the upper limit of the hole
(c) Greater than the lower limit of the hole
(d) Lesser than the lower limit of the hole

Ans. (a)

GATE 2011

A hole is of dimension $\phi 9^{+0.015}_{+0}$ mm. The corresponding shaft is of dimension $\phi 9^{+0.010}_{+0.001}$ mm. The resulting assembly has

(a) loose running fit
(b) close running fit
(c) transition fit
(d) interference fit

Ans. (c)

IES - 2007

Which one of the following is a clearance fit?

(a) $\varphi H50^{+0.015}_{+0.005}$ $h50^{-0.010}_{+0.000}$
(b) $\varphi H50^{+0.010}_{+0.000}$ $h50^{+0.025}_{+0.015}$
(c) $\varphi H50^{-0.015}_{+0.000}$ $h50^{+0.025}_{+0.005}$
(d) $\varphi H50^{-0.010}_{-0.000}$ $h50^{+0.030}_{+0.005}$

Ans. (a)

Set-2

IES - 2006

Which of the following is an interference fit?

(a) Push fit
(b) Running fit
(c) Sliding fit
(d) Shrink fit

Ans. (d)

IES - 2009

Consider the following joints:

1. Railway carriage wheel and axle
2. IC engine cylinder and liner

Which of the above joints is/are the result(s) of interference fit?

(a) 1 only
(b) 2 only
(c) Neither 1 nor 2
(d) Both 1 and 2

Ans. (d)

IES - 2008

Consider the following statements:

1. The amount of interference needed to create a tight joint varies with diameter of the shaft.
2. An interference fit creates no stress state in the shaft.
3. The stress state in the hub is similar to a thick-walled cylinder with internal pressure.

Which of the statements given above are correct?

(a) 1, 2 and 3 (b) 1 and 2 only
(c) 2 and 3 only (d) 1 and 3 only

Ans. (d)

IES - 2004

Consider the following fits:

1. I.C. engine cylinder and piston
2. Ball bearing outer race and housing
3. Ball bearing inner race and shaft

Which of the above fits are based on the interference system?

(a) 1 and 2
(b) 2 and 3
(c) 1 and 3
(d) 1, 2 and 3 Ans. (b)

IES - 2003

Match List-I (Phenomenon) with List-II (Significant Parameters/Phenomenon) and select the correct answer using the codes given below the Lists:

List-I (Phenomenon)	**List-II (Significant Parameters/Phenomenon)**
A. Interference fit	1. Viscosity index
B. Cyclic loading	2. Interference
C. Gear meshing	3. Notch sensitivity
D. Lubricating of bearings	4. Induced compressive stress

[Ans. (b)]

Codes:	**A**	**B**	**C**	**D**		**A**	**B**	**C**	**D**
(a)	3	4	1	2	(b)	4	3	2	1
(c)	3	4	2	1	(d)	4	3	1	2

IES - 2005

Assertion (A): Hole basis system is generally preferred to shaft basis system in tolerance design for getting the required fits.

Reason (R): Hole has to be given a larger tolerance band than the mating shaft.

(a) Both A and R are individually true and R is the correct explanation of A
(b) Both A and R are individually true but R is **not** the correct explanation of A
(c) A is true but R is false
(d) A is false but R is true [Ans. (c)]

Set-2

IES-2006 Conventional

Find the limit sizes, tolerances and allowances for a 100 mm diameter shaft and hole pair designated by F_8h_{10}. Also specify the type of fit that the above pair belongs to. Given: 100 mm diameter lies in the diameter step range of 80-120 mm. The fundamental deviation for shaft designation 'f' is $-5.5\ D^{0.41}$

The values of standard tolerances for grades of IT 8 and IT 10 are 25i and 64i respectively.

Also, indicate the limits and tolerance on a diagram.

[15-Marks]

IES - 2008

Consider the following statements:

A nomenclature ϕ 50 H8/p8 denotes that

1. Hole diameter is 50 mm.
2. It is a shaft base system.
3. 8 indicates fundamental deviation.

Which of the statements given above is/are correct?

(a) 1, 2 and 3
(b) 1 and 2 only
(c) 1 and 3 only
(d) 3 only [Ans. (None)]

IES - 2002

In the tolerance specification 25 D 6, the letter D represents

(a) Grade of tolerance
(b) Upper deviation
(c) Lower deviation
(d) Type of fit [Ans. (c)]

GATE - 2009

What are the upper and lower limits of the shaft represented by 60 f_8?

Use the following data:

Diameter 60 lies in the diameter step of 50-80 mm. Fundamental tolerance unit,

i, in μ m= $0.45\ D^{1/3} + 0.001D$, where D is the representative size in mm; [Ans. (a)]

Tolerance value for IT8 = 25i.

Fundamental deviation for 'f shaft = $-5.5D^{0.41}$

(a) Lower limit = 59.924 mm, Upper Limit = 59.970 mm
(b) Lower limit = 59.954 mm, Upper Limit = 60.000 mm
(c) Lower limit = 59.970 mm, Upper Limit = 60.016 mm
(d) Lower limit = 60.000 mm, Upper Limit = 60.046 mm

GATE - 2000

A fit is specified as 25H8/e8. The tolerance value for a nominal diameter of 25 mm in IT8 is 33 microns and fundamental deviation for the shaft is - 40 microns. The maximum clearance of the fit in microns is

(a) -7
(b) 7
(c) 73
(d) 106

[Ans. (d)]

GATE - 1996

The fit on a hole-shaft system is specified as H7-s6.The type of fit is

(a) Clearance fit
(b) Running fit (sliding fit)
(c) Push fit (transition fit)
(d) Force fit (interference fit)

[Ans. (d)]

Set-2

GATE - 2003

The dimensional limits on a shaft of 25h7 are

(a) 25.000, 25.021 mm

(b) 25.000, 24.979 mm

(c) 25.000, 25.007 mm

(d) 25.000, 24.993 mm

[Ans. (b)]

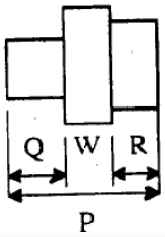
GATE - 2003

A part shown in the figure is machined to the sizes given below

$P = 35.00 \pm 0.08$ mm

$Q = 12.00 \pm 0.02$ mm

$R = 13.00^{+0.04}_{-0.02}$ mm



With 100% confidence, the resultant dimension W will have the specification

(a) 9.99 ± 0.03 mm

(b) 9.99 ± 0.13 mm

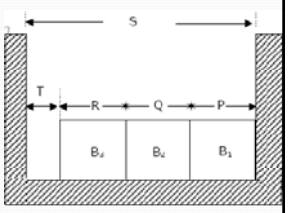
(c) 10.00 ± 0.03 mm

(d) 10.00 ± 0.13 mm

[Ans. (b)]

GATE - 1997

Three blocks B_1, B_2 and B_3 are to be inserted in a channel of width S maintaining a minimum gap of width T = 0.125 mm, as shown in Figure.



For P = 18. 75 ± 0.08;

Q = 25.00 ± 0.12;

R = 28.125 ± 0.1 and

S = 72.35 + X, (where all dimensions are in mm), the tolerance X is

(a) + 0.38 (b) - 0.38 (c) + 0.05 (d) -0.05

[Ans. (d)]

IES - 2000

Which one of the following tolerances set on inner diameter and outer diameter respectively of headed jig bush for press fit is correct?

(a) G7 h 6 (b) F7 n6

(c) H 7h 6 (d) F7j6

[Ans. (b)]

GATE - 2004

GO and NO-GO plug gages are to be designed for a hole $20^{0.05}_{0.01}$ mm. Gage tolerances can be taken as 10% of the hole tolerance. Following ISO system of gage design, sizes of GO and NO-GO gage will be respectively

(a) 20.010 mm and 20.050 mm

(b) 20.014 mm and 20.046 mm

(c) 20.006 mm and 20.054 mm

(d) 20.014 mm and 20.054 mm [Ans. (b)]

GATE - 1995

Checking the diameter of a hole using GO-NO-GO gauges is an, example of inspection by .....(variables/attributes)

The above statement is

(a) Variables

(b) Attributes

(c) Cant say

(d) Insufficient data [Ans. (b)]

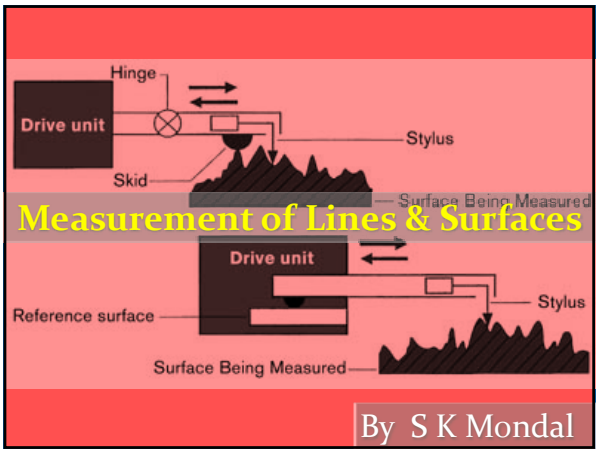
GATE - 2006

A ring gauge is used to measure

(a) Outside diameter but not roundness
(b) Roundness but not outside diameter
(c) Both outside diameter and roundness
(d) Only external threads

[Ans. (c)]

Set-2



GATE – 2008 S-1

A displacement sensor (a dial indicator) measures the lateral displacement of a mandrel mounted on the taper hole inside a drill spindle. The mandrel axis is an extension of the drill spindle taper hole axis and the protruding portion of the mandrel surface is perfectly cylindrical. Measurements are taken with the sensor placed at two positions P and Q as shown in the figure. The readings are recorded as R_x = maximum deflection minus minimum deflection, corresponding to sensor position at X, over one rotation.

GATE – 2008 contd... from S-1

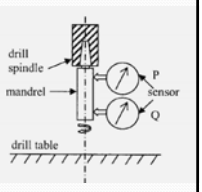
If $R_P = R_Q > 0$, which one of the following would be consistent with the observation?

(A) The drill spindle rotational axis is coincident with the drill spindle taper hole axis

(B) The drill spindle rotational axis intersects the drill spindle taper hole axis at point P

(C) The drill spindle rotational axis is parallel to the drill spindle taper hole axis

(D) The drill spindle rotational axis intersects the drill spindle taper hole axis at point Q [Ans. (c)]



IES - 2006

The M and E-system in metrology are related to measurement of:

(a) Screw threads (b) Flatness

(c) Angularity (d) Surface finish

[Ans. (d)]

IES - 2007

What is the dominant direction of the tool marks or scratches in a surface texture having a directional quality, called?

(a) Primary texture (b) Secondary texture

(c) Lay (d) Flaw

[Ans. (c)]

IES - 2008

What term is used to designate the direction of the predominant surface pattern produced by machining operation?

(a) Roughness (b) Lay

(c) Waviness (d) Cut off

[Ans. (b)]

Set-2

IES 2010

Match List I with List II and select the correct answer using the code given below the lists:

List I (Symbols for direction of lay)

A. =

B. ×

C. I

D. R

List II (Surface texture)

1. 
2. 
3. 
4. 

[Ans. (b)]

	A	B	C	D		A	B	C	D
(a)	4	2	1	3	(b)	3	2	1	4
(c)	4	1	2	3	(d)	3	1	2	4

IES - 2008

What symbol is used to indicate surface roughness?

(a) = (b) $\sqrt{\ }$

(c) $\sqrt[0.1]{\ }$ (d) Δ

[Ans. (b)]

GATE - 1997

List I	List II
(A) Surface profilometer	1. Calibration
(B) Light Section Microscope	2. Form tester
(C) Microkater	3. Film thickness measurement
(D) Interferometer	4. Centre line average
	5. Comparator
	6. Surface lay measurement

[Ans. (b)]

Codes:	A	B	C	D		A	B	C	D
(a)	4	1	2	3	(b)	4	3	5	1
(c)	4	2	1	3	(d)	3	1	2	4

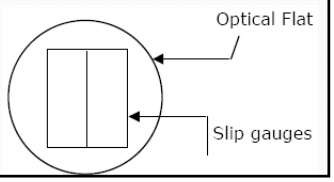
GATE - 2003

Two slip gauges of 10 mm width measuring 1.000 mm and 1.002 mm are kept side by side in contact with each other lengthwise. An optical flat is kept resting on the slip gauges as shown in the figure. Monochromatic light of wavelength 0.0058928 mm is used in the inspection. The total number of straight fringes that can be observed on both slip gauges is

(a) 2 (b) 6

(c) 8 (d) 13

[Ans. (a)]



Set-2

GATE - 1998

Auto collimator is used to check

(a) Roughness
(b) Flatness
(c) Angle
(d) Automobile balance.

[Ans. (c)]

IES - 1998

Match List-I with List-II and select the correct answer using the codes given below the lists:

List-I (Measuring Device)		List-II (Parameter Measured)
A. Diffraction grating	1.	Small angular deviations on long flat surfaces
B. Optical flat	2.	On-line measurement of moving parts
C. Auto collimators	3.	Measurement of gear pitch
D. Laser scan micrometer	4.	Surface texture using interferometer
	5.	Measurement of very small displacements

Code:	A	B	C	D		A	B	C	D
(a)	5	4	2	1	(b)	3	5	1	2
(c)	3	5	4	1	(d)	5	4	1	2

[Ans. (d)]

GATE - 1992

Match the instruments with the physical quantities they measure:

Instrument		Measurement
(A) Pilot-tube	(1)	R.P.M. of a shaft
(B) McLeod Gauge	(2)	Displacement
(C) Planimeter	(3)	Flow velocity
(D) LVDT	(4)	Vacuum
	(5)	Surface finish
	(6)	Area

[Ans. (b)]

Codes:	A	B	C	D		A	B	C	D
(a)	4	1	2	3	(b)	3	4	6	2
(c)	4	2	1	3	(d)	3	1	2	4

GATE - 2004

Match the following

Feature to be inspected	Instrument
P Pitch and Angle errors of screw thread	1. Auto Collimator
Q Flatness error of a surface plate	2. Optical Interferometer
R Alignment error of a machine slide way	3. Dividing Head and Dial Gauge
S Profile of a cam	4. Spirit Level
	5. Sine bar
	6. Tool maker's Microscope

[Ans. (b)]

(a) P-6 Q-2 R-4 S-6 (b) P-5 Q-2 R-1 S-6
(c) P-6 Q-4 R-1 S-3 (d) P-1 Q-4 R-4 S-2

GATE - 1995

List I (Measuring instruments)		List II (Application)
(A) Talysurf	1.	T-slots
(B) Telescopic gauge	2.	Flatness
(C) Transfer callipers	3.	Internal diameter
(D) Autocollimator	4.	Roughness

Codes:	A	B	C	D		A	B	C	D
(a)	4	1	2	3	(b)	4	3	1	2
(c)	4	2	1	3	(d)	3	1	2	4

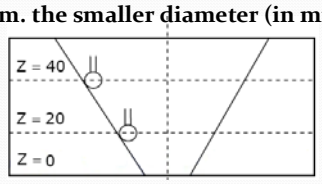
[Ans. (b)]

Set-2

GATE - 2010

A taper hole is inspected using a CMM, with a probe of 2 mm diameter. At a height, Z = 10 mm from the bottom, 5 points are touched and a diameter of circle (not compensated for probe size) is obtained as 20 mm. Similarly, a 40 mm diameter is obtained at a height Z = 40 mm. the smaller diameter (in mm) of hole at Z = 0 is

(a) 13.334
(b) 15.334
(c) 15.442
(d) 15.542



[Ans. (a)]

IAS - 2001

For transporting materials over long distances with greater speed, which one of the following devices is most suitable?

(a) Motor vehicle
(b) Industrial vehicle
(c) Belt conveyor
(d) Roller conveyor

[Ans. (b)]

IAS - 1995

For moving materials is varying paths, the material handling equipments that is not suitable is

(a) Crane
(b) Conveyor
(c) Truck
(d) Hand trolley

[Ans. (b)]

IAS - 1994

Consider the following situations

1. Loads are uniform
2. Materials move relatively continuously
3. Movement rate is variable
4. Routes do not vary

For material transportation, conveyors are used when the prevailing conditions include

(a) 1, 3, and 4 (b) 1, 2, and 3
(c) 1, 2, and 4 (d) 2, 3 and 4

[Ans. (c)]

IES - 2001

During manufacture of cement, the handling of limestone is done by

(a) Belt conveyor
(b) Bucket conveyor
(c) Overhead crane
(d) Fork-lift crane

[Ans. (b)]

IAS - 1998

Match List-I (Material handling equipments) with List-II (Application in a foundry) and select the correct answer using the codes given below the lists:

	List – I		**List-II**
A.	Belt conveyor	1.	To move the compacted mould boxes
B.	Monorail conveyor	2.	To move the prepared moulding sand
C.	Apron conveyor	3.	To move the rough casting to the fettling station
D.	Roller conveyor	4.	To transfer he molten metal ladle

[Ans. (d)]

Codes:	**A**	**B**	**C**	**D**		**A**	**B**	**C**	**D**
(a)	1	2	3	4	(b)	2	1	3	4
(c)	2	4	1	3	(d)	2	4	3	1

Set-2

IAS - 1997

Elevators are used for moving materials

(a) Along fixed and horizontal paths
(b) In a vertical direction along a fixed path
(c) Along a horizontal path to any distance
(d) In both the planes

[Ans. (b)]

IES - 1994

Killed steels

(a) Have minimum impurity level
(b) Have almost zero percentage of phosphorus and sulphur
(c) Are produced by LD process
(d) Are free from oxygen

[Ans. (d)]

IES - 1992

Dye penetration method is generally used to locate

(a) Core defects
(b) Surface defects
(c) Superficial defects
(d) Temporary defects

[Ans. (b)]

IES - 1999

Transfer machines can be defined as

(a) Material processing machines
(b) Material handling machines
(c) Material processing and material handling machines
(d) Component feeders for automatic assembly

[Ans. (c)]

IES - 2000

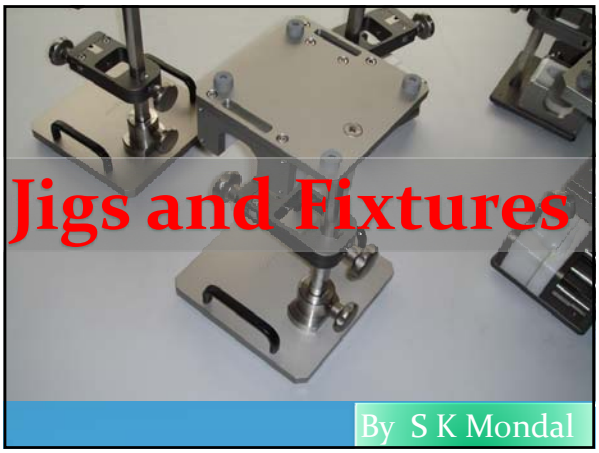
A screw thread specified by M 20 x 2.5 C as per BIS thread system means

(a) Metric thread of 20 mm nominal diameter and 2.5 mm pitch having coarse tolerance
(b) Metric thread of 20 mm root diameter and 2.5 mm pitch having coarse tolerance
(c) Metric thread of fine class having 20 mm root diameter and 2.5 mm pitch
(d) Metric thread of 20 mm shank diameter and 2.5 mm thread depth with coarse tolerance [Ans. (c)]

Ch-13: Metrology

Q. No	Option	Q. No	Option
1	C	10	D
2	C	11	D
3	A	12	B
4	C	13	B
5	C	14	D
6	B	15	B
7	C	16	C
8	B	17	B
9	B		

Set-2



GATE - 1999

Choose the correct statement:

(a) A fixture is used to guide the tool as well as to locate and clamp the workpiece

(b) A Jig is used to guide the tool as well as to locate and clamp the workpiece

(c) Jigs arc used on CNC machines to locate and clamp the workpiece and also to guide the tool

(d) No arrangement to guide the tool is provided in a jig.

[Ans. (b)]

IES - 2007

According to the principle of location in jigs and fixtures, how many degrees of freedom are to be eliminated to have a body fixed in space?

(a) 3

(b) 4

(c) 5

(d) 6

[Ans. (d)]

GATE - 2005

When 3-2-1 principle is used to support and locate a three dimensional work-piece during machining, the number of degrees of freedom that are restricted is

(a) 7

(b) 8

(c) 9

(d) 10

[Ans. (c)]

GATE - 2001

3-2-1 method of location in a jig or fixture would collectively restrict the workpiece in n degrees of freedom, where the value of n is

(a) 6

(b) 8

(c) 9

(d) 12

[Ans. (c)]

IES 2011

In the 3-2-1 principle of fixture 3 refers to number of :

(a) Setups possible

(b) Clamps required

(c) Positions on primary face

(d) Locating positions

[Ans. (d)]

Set-2

IES – 1998, 1999

Diamond pin location is used in a fixture because

(a) It does not wear out

(b) It takes care of any variation in centre distance between two holes

(c) It is easy to clamp the part on diamond pins

(d) It is easy to manufacture

[Ans. (b)]

IES - 2009

A lever having two precisely drilled holes, one smaller than the other, has to be located in a fixture using hardened and ground plugs for further machining in relation to the holes. Select the correct method of locating the lever from the given alternatives.

(a) Using two hardened and ground plugs, the smaller one having flats machined on each side

(b) Using two hardened and ground plugs

(c) Using one hardened and ground plug and one V-block

(d) Using two V-blocks [Ans. (a)]

IES - 1995

If the diameter of the hole is subject to considerable variation, then for locating in jigs and fixtures, the pressure type of locator used is

(a) Conical locator

(b) Cylindrical locator

(c) Diamond pin locator

(d) Vee locator [Ans. (a)]

IES - 2005

Match List I (An Element of Jigs and Fixtures) with List II (Associating System) and select the correct answer using the code given below the Lists:

	List I		List II
A	Bush	1.	Milling fixture
B.	Setting block	2.	Turning fixture
C.	Diamond pin	3.	Radial location
D.	V-block	4.	Cylindrical location
		5.	Drill jigs

[Ans. (c)]

Codes:	A	B	C	D		A	B	C	D
(a)	5	4	3	1	(b)	3	1	2	4
(c)	5	1	3	4	(d)	3	4	2	1

IES - 2000

Match List I (Components used in jigs and fixtures) with List II (Their functions) and select the correct answer using the codes given below the Lists:

	List I		List II
A.	Jack pin	1.	To guide the drill bit during machining
B.	V-locator	2.	For easy removal of the work piece from the jig or fixture after the machining operation is over
C.	Bushes	3.	To locate the circular or semicircular objects in a jig or fixture
D.	Ejectors	4.	To locate work piece whose dimensions are subject to variations

[Ans. (b)]

Code:	A	B	C	D		A	B	C	D
(a)	3	4	1	2	(b)	4	3	1	2
(c)	2	4	3	1	(d)	4	2	3	1

IES - 1995

Match List I with List Ii and select the correct answer using the codes given below the lists:

List I (Task)	List II (Recommendation)
A. Three components in a straight line should worked in one loading	1. Clamp with a floating pad.
B. Unloading of clamp element from jig is essential	2. Quick action nut
C. Clamping of rough surfaces	3. Cam clamp
D. Need for heavy clamping force	4. Equalising clamp
	5. Strap clamp

Code:	A	B	C	D		A	B	C	D
(a)	5	2	3	4	(b)	4	2	1	5
(c)	1	4	2	3	(d)	4	1	5	3

[Ans. (d)]

Set-2

IES - 2005

Which one of the following is the most significant property to be considered in the selection of material for the manufacture of locating pins and drill jig buses used in jigs and fixtures?

(a) Wear resistance (b) Elasticity

(c) Shear strength (d) Tensile strength

[Ans. (a)]

IES - 1996

Assertion (A): A workpiece with rough un-machined surface can be located in a jig or fixture on three supporting points.

Reason (R): Indexing is made accurate by supporting on three points.

(a) Both A and R are individually true and R is the correct explanation of A

(b) Both A and R are individually true but R is **not** the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true [Ans. (c)]

IES - 1996

Consider the following statements:

The cutter setting block in a milling fixture

1. Sets the cutting tool with respect of two of its surfaces.
2. Limits the total travel required by the cutter during machining.
3. Takes location from the location scheme of the component.

(a) 1,2 and 3 are correct (b) 1 and 2 are correct

(c) 2 and 3 are correct (d) 1 and 3 are correct

[Ans. (d)]

IES - 1993

The floating position of the holding fixture in a rotary transfer device is used to

(a) Improve the accuracy of location

(b) Reduce the tendency to over index

(c) Reduce the cycle time

(d) Improve upon the acceleration and deceleration characteristics

[Ans. (d)]

Jigs and Fixtures

Q. No	Option	Q. No	Option
1	C	6	C
2	D	7	D
3	B	8	D
4	B	9	C
5	C		