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Courses » Computer numerical control (CNC) of machine tools and processes

Announcements Course Ask a Question Progress Mentor

Unit 5 - Week 4: 3-D Machining, Curved Surface Geometry and Cutter Path generation, Tutorial

Course outline

How to access the portal ?

Week1- Computer Numerical Control Machines : Introduction and Classification

Week2: Technologies and devices employed in CNC machines

Week 3: Computer aided offline programming practice, Linear and curvilinear interpolator, Tutorial

Week 4: 3-D Machining, Curved Surface Geometry and Cutter Path generation, Tutorial

- Lecture 16 : 3-D Machining - Basic Concepts
- Lecture 17 : Curved Surface Geometry
- Lecture 18 : Cutter Path Generation for Curved Surfaces

Assignment-4

The due date for submitting this assignment has passed. **Due on 2016-10-08, 22:00 IST.**

Submitted assignment

1) If zig-zag milling (Note : zig-zag means cutter moving to- and-fro to cut the work piece surface and taking side steps at the ends of the to-and-fro motion) is carried out to obtain a free form surface from a blank part on a 3-axis CNC milling machine with ball end milling cutter, scallop height (height of the uncut ridges left behind between cutter paths) is a function of 1 point

- Cutting speed and feed rate of cutter
- Side step, ball-end diameter of cutter and radius of curvature of free form surface in cutting direction
- Side step, ball-end diameter of cutter and radius of curvature of free form surface orthogonal to cutting direction
- None of the others

No, the answer is incorrect.

Score: 0

Accepted Answers:

Side step, ball-end diameter of cutter and radius of curvature of free form surface orthogonal to cutting direction

2) Isoparametric zig-zag machining is carried out on a part to obtain a free form surface (surface 1) with a ball-end milling cutter **A** on 3-axis machining centre by employing cutter location points which are calculated from a set of cutter contact points (let this set be **F**) and ball end radius of **A**. Now, if another ball-end milling cutter **B** with larger ball-end diameter cuts out another part (surface 2) by employing cutter location points derived from **F** and ball end radius of **B**, the part surface 2 would have 1 point

- No difference in surface roughness (due to scallops) compared to surface roughness of surface 1
- Lower surface roughness as compared to surface roughness of surface 1
- Higher surface roughness as compared to surface roughness of surface 1
- None of the others

No, the answer is incorrect.

Score: 0

Accepted Answers:

Lower surface roughness as compared to surface roughness of surface 1

- Lecture 19 :
Cutter Path Generation (Concluding Part) and Current Status - CNC Machining and Related Processes
- Lecture 20 :
Questions and Discussions on Curved Surface Machining
- Notes on Sculptured Surface Machining
- Quiz :
Assignment-4
- Solution to Assignment-4
- Lathe Programming Explanations

Lecture notes:
pdf of all ppts shown

3) If, during the production of a free form surface from a part 1 point
by zig-zag machining on a 3-axis CNC milling machine with a ball-end milling cutter, the cutter contact points of a cutter path are all in the X-Z plane, the cutter while traversing that path,

- May have Y axis movement
- Will definitely have Y axis movement
- None of the others
- Will have no Y axis movement

No, the answer is incorrect.

Score: 0

Accepted Answers:

May have Y axis movement

4) At a particular point on a smooth curved surface, there 1 point
is/are

- Only one tangent
- Only two tangents
- None of the others
- Infinite number of tangents

No, the answer is incorrect.

Score: 0

Accepted Answers:

Infinite number of tangents

5) During CNC free form surface zig-zag machining by ball 1 point
end milling on 3-axis machining centre, the points on the free form surface contacted by the cutter

- Are called the cutter location points
- Are the points through which the center of the cutter is moved
- None of the others
- Are the points through which the bottom-most point of the cutter is moved
- Are called the cutter contact points

No, the answer is incorrect.

Score: 0

Accepted Answers:

Are called the cutter contact points

6) In isoscallop zig-zag machining of free form surface in CNC 1 point
3-axis machine with ball ended milling cutter, uniform surface roughness (across lay lines) is obtained by

- Forward steps with circular arc approximation
- Forward steps of equal parametric increments
- Equal forward steps
- Equal side steps
- None of the others

No, the answer is incorrect.

Score: 0

Accepted Answers:

None of the others

7) In the fig.1, a Bezier surface $R(u,w)$ is intersected by a vertical plane with unit 1 point
normal \mathbf{p} . At any point X on the curve of intersection, the unit normal to the Bezier surface is \mathbf{n}

and tangent to the dotted curve of intersection is \mathbf{c} . $\frac{\partial R}{\partial u}$ and $\frac{\partial R}{\partial w}$ are taken at X

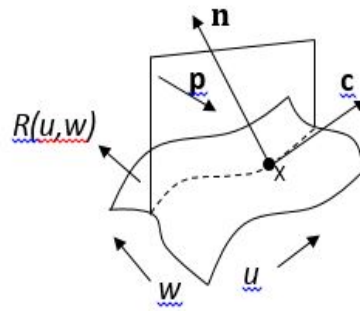


Fig. 1

The correct statement(s) is/are

- \mathbf{n} and \mathbf{p} are necessarily normal to each other
- $\frac{\partial R}{\partial u}$ and $\frac{\partial R}{\partial w}$ are necessarily normal to each other
- $\frac{\partial R}{\partial u}$, $\frac{\partial R}{\partial w}$ and \mathbf{c} are necessarily coplanar
- $\frac{\partial R}{\partial w}$ and \mathbf{p} are necessarily normal to each other
- None of the others

No, the answer is incorrect.

Score: 0

Accepted Answers:

$\frac{\partial R}{\partial u}$, $\frac{\partial R}{\partial w}$ and \mathbf{c} are necessarily coplanar

8) For Isoplanar CNC free form surface zig-zag machining with Ball-ended milling cutter **1 point**

- The scallop height in between any two adjacent cutter paths necessarily remains constant
- Five axis CNC machining center is a must
- Forward step lengths are necessarily equal in length all over the surface
- None of the others

No, the answer is incorrect.

Score: 0

Accepted Answers:

None of the others

9) In 3 axis CNC zig-zag ball-end milling of free form surfaces, **1 point** if a very low roughness (due to scallops) is required

- Cutter side step should be increased
- Cutter side step should be decreased
- Cutting speed should be increased
- Depth of cut should be increased
- Depth of cut should be decreased
- None of the others

No, the answer is incorrect.

Score: 0

Accepted Answers:

Cutter side step should be decreased

10) The length of a forward step taken by a ball end milling cutter along a cutter path during zig-zag CNC machining on a 3-axis machining centre will depend on **1 point**

- The speed of the cutter
- The radius of curvature of the free form surface at the point of consideration in a direction perpendicular to the cutter path
- The form tolerance (allowable deviation between actual cut profile and free form surface profile)
- None of the others

No, the answer is incorrect.

Score: 0

Accepted Answers:

The form tolerance (allowable deviation between actual cut profile and free form surface profile)

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