

Unit 11 - Week 9 - Introduction to Electrochemical Machining

Course outline

How does an NPTEL online course work?

Week 0

Week 1 - Basics of Manufacturing Processes

Week 2 - Introduction to casting process

Week 3 - Gating Systems and Rate of solidification

Week 4 - Estimation of solidification time with different conditions and Riser design

Week 5 - Machining Processes

Week 6 - Cutting tool life estimation

Week 7 - Introduction to Micro-Systems Fabrication Technology

Week 8 - Abrasive water jet machining and Ultrasonic Machining

Week 9 - Introduction to Electrochemical Machining

- Material Removal Rate of ECM
- Concept of Electrode Double Layer
- Material removal rate of an alloy in ECM
- Kinematics and Dynamics of ECM
- Temperature and Pressure rise during ECM
- Determination of Electrolyte flow velocity in ECM
- Theoretical determination of Tool shape

Quiz : Assignment 9

Assignment 9 solution

Manufacturing Process Technology I and II: Feedback For Week 09

Week 10 - Electro-discharge Machining Process

Week 11 - Laser Beam and Electron Beam Machining Processes

Week 12 - Metal Forming Processes

Text Transcripts

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Assignment 9

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-04-01, 23:59 IST.

Assignment 9

1) Electrode double layer is generated in which case? 1 point

- When an electrode is supplied with an electric current.
- When an electrode is dipped into a solution of an electrolyte.
- When an electrode is rubbed against a neutral charge surface.
- None of the above.

No, the answer is incorrect.
Score: 0

Accepted Answers:
When an electrode is dipped into a solution of an electrolyte.

2) Which of the following is not true corresponding to the volume removal rate in electrochemical machining? 1 point

- It is directly proportional to the density of the anode.
- It is directly proportional to the current.
- It is inversely proportional to the valency of the cations.
- All of the above statements are true.

No, the answer is incorrect.
Score: 0

Accepted Answers:
It is directly proportional to the density of the anode.

3) Determine the current required for machining iron (Atomic weight= 55.85 g, valency = 3, and density= 7.86 g/cm³) for achieving volume removal rate of 15 cm³/s. 0 points

- 6801.32 A
- 12930.13 A
- 3204.39 A
- 10185.6 A

No, the answer is incorrect.
Score: 0

Accepted Answers:
10185.6 A

4) The composition of the Nimonic alloy turbine blade is 18% cobalt, 62% nickel, and 20% chromium. It is being machined electrochemically with a current of 1500 Amp, find out the volume removal rate (cm³/s). The dissolution valency of chromium is 6 whereas that for both nickel and cobalt is 2. (Additional data: Gram atomic weights of cobalt, nickel, and chromium are 58.93, 58.71, and 51.99 respectively. Densities (g/cm³) of cobalt, nickel, and chromium are 8.85, 8.9, and 7.19 respectively) 1 point

- 0.0123
- 0.0592
- 0.0363
- 0.1461

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.0363

5) What are the various types of overvoltages in ECM? 1 point

- Activation polarization, Ohmic, and Discharge
- Electrode, Ohmic, and Concentration gradient
- Activation polarization, Ohmic, and Concentration gradient
- None of the above.

No, the answer is incorrect.
Score: 0

Accepted Answers:
Activation polarization, Ohmic, and Concentration gradient

6) The curved surfaces and impressions can be produced by the following processes: 1 point

- Ultrasonic machining and electric discharge machining respectively
- Electric discharge machining and ultrasonic machining respectively
- Electrochemical machining and ultrasonic machining respectively
- Laser beam machining and electrochemical machining respectively

No, the answer is incorrect.
Score: 0

Accepted Answers:
Electrochemical machining and ultrasonic machining respectively

7) If the feed is zero in ECM, the gap, y _____, where y_0 , λ , and t are initial gap, process constant calculated through various parameters, and time respectively. 1 point

- Decreases, following the function $y = (y_0^2 - 2\lambda t)^{1/2}$.
- Increases, following the function $y = (y_0^2 + \lambda t)^{1/2}$.
- Decreases, following the function $y = (y_0^2 - \lambda t)^{1/2}$.
- Increases, following the function $y = (y_0^2 + 2\lambda t)^{1/2}$.

No, the answer is incorrect.
Score: 0

Accepted Answers:
Increases, following the function $y = (y_0^2 + 2\lambda t)^{1/2}$.

8) Which of the following statement is most appropriate for the equilibrium gap? 1 point

- It is inversely proportional to feed.
- It is calculated through no gap change condition.
- It is corresponding to a constant feed case.
- All of the above statements are true.

No, the answer is incorrect.
Score: 0

Accepted Answers:
All of the above statements are true.

9) Why is the electrolyte flow necessary in ECM? 1 point

- To avoid deposition on the tool.
- To avoid precipitation.
- To avoid overheating.
- All of the above statements are true.

No, the answer is incorrect.
Score: 0

Accepted Answers:
All of the above statements are true.

10) The height of peaks of surface irregularities of the two electrodes (with flat surfaces) are 7 microns and 10 microns. The workpiece is pure iron (Atomic weight= 55.85 g, valency = 3, and density= 7.86 g/cm³) applied with a voltage of 15 V. Estimate the highest possible feed rate that can be used. (Conductivity= 0.25 $\Omega^{-1}\text{cm}^{-1}$ and Overvoltage= 1.5 V) 1 point

- 0.12 cm/s
- 0.048 cm/s
- 0.02 cm/s
- 0.083 cm/s

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.048 cm/s