

Unit 6 - Week 4 - Estimation of solidification time with different conditions and Riser design

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

- Solidification with Predominant Interface Resistance
- Solidification with Constant Casting Surface Temperature
- Solidification of Casting with Predominant Resistance in Mold and Solidified Metal
- Solidification Time for Permanent Mold Casting
- Solidification with Constant Casting Surface Temperature
- Riser Design and Placement (Part-1)
- Riser Design and Placement (Part-2)
- Riser Design and Placement (Part-3)

- Quiz : Assignment 4
- Assignment 4 solution
- Manufacturing Process Technology I and II: Feedback For Week 04

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

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 4

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

Due on 2020-02-26, 23:59 IST.

Assignment 4

1) Determine solidification time of the slab-shaped 15 cm thick casting of cast iron when it is poured with no superheats, into sand molds at the initial temperature (28 °C). (Consider, Data for CI, $\theta_f = 1540$ °C, $L = 272$ kJ/kg, $\rho_m = 7850$ kg/m³, Data for sand, $c = 1.17$ kJ/kg-K, $K = 0.8655$ W/m-K, $\rho = 1600$ kg/m³) **1 point**

- ≈ 30 min
- ≈ 134 min
- ≈ 91 min
- ≈ 10 min

No, the answer is incorrect.
Score: 0

Accepted Answers:
≈ 91 min

2) Which of the following region in casting shows the linear (steep) decrease in the temperature? **1 point**

- Mold-metal interface
- Mold
- Solidified metal
- Liquid metal

No, the answer is incorrect.
Score: 0

Accepted Answers:
Mold-metal interface

3) Determine solidification time of the sphere-shaped 15 cm diameter casting of cast iron when it is poured with no superheats, into sand molds at the initial temperature (28 °C). (Consider, Data for CI, $\theta_f = 1540$ °C, $L = 272$ kJ/kg, $\rho_m = 7850$ kg/m³, Data for sand, $c = 1.17$ kJ/kg-K, $K = 0.8655$ W/m-K, $\rho = 1600$ kg/m³) **1 point**

- ≈ 72 min
- ≈ 7 min
- ≈ 1 min
- ≈ 101 min

No, the answer is incorrect.
Score: 0

Accepted Answers:
≈ 7 min

4) The condition for no contact resistance in welding observes which of the phenomenon? **1 point**

- Casting doesn't dry.
- Casting gets soldered to the mold face.
- Casting permeability increases tremendously.
- Casting dry out instantly.

No, the answer is incorrect.
Score: 0

Accepted Answers:
Casting gets soldered to the mold face.

5) In which way metal mold varies from the sand mold while undergoing solidification? **1 point**

- Metal mold doesn't dry out without any additional coolant.
- Metal mold always provides a larger mold cavity to accommodate larger sections in one go and hence takes more time to solidify.
- The thermal conductivity of the solidified metal may provide considerable thermal resistance.
- None of the above.

No, the answer is incorrect.
Score: 0

Accepted Answers:
The thermal conductivity of the solidified metal may provide considerable thermal resistance.

6) What should be the most appropriate design consideration for choosing dimensions of a specifically shaped riser? **1 point**

- It is chosen to give a maximum A/V ratio.
- It is not affected by the A/V ratio at all.
- It is chosen for A/V ratio equal to 1.
- It is chosen to give a minimum A/V ratio.

No, the answer is incorrect.
Score: 0

Accepted Answers:
It is chosen to give a minimum A/V ratio.

7) Determine the dimensions of a cylindrical riser to be used for casting an aluminum cube of sides 20 cm. The volume shrinkage of aluminum during solidification is 6.5%. **1 point**

- $d > 20$ cm, $h > 20$ cm
- $d = 12.57$ cm, $h = 12.57$ cm
- $d > 20$ cm, $h < 20$ cm
- Any of these can be true.

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $d > 20$ cm, $h > 20$ cm

8) Canne's relationship is based on the assumption that: **1 point**

- Cooling rate is linearly proportional to the ratio of surface area to volume.
- Cooling rate is inversely proportional to the ratio of surface area to volume.
- Cooling rate is linearly proportional to the cube of the ratio of surface area to volume.
- None of these.

No, the answer is incorrect.
Score: 0

Accepted Answers:
Cooling rate is linearly proportional to the ratio of surface area to volume.

9) Dimensions of riser depend on which of the following condition? **1 point**

- $(A/V)_c < (A/V)_r$
- $(A/V)_c = (A/V)_r$
- $(A/V)_c > (A/V)_r$
- Any of the above.

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $(A/V)_c > (A/V)_r$

10) Which of the following factors is independent of the direction of crystal growth in an alloy? **1 point**

- Thermal gradient
- Material aesthetics
- Composition gradient
- Variation of solidus temperature

No, the answer is incorrect.
Score: 0

Accepted Answers:
Material aesthetics