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Courses » Advances in Welding and Joining Technologies

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Unit 5 - Week 4: Computational Welding Mechanics

Course outline

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Fundamentals of Welding and Joining

Week 2: Laser and Electron Beam Welding

Week 3: Solid State Welding Processes

Week 4:
Computational Welding Mechanics

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Computational Welding Mechanics Part I

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Computational Welding Mechanics Part II

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Computational Welding Mechanics Part III

Quiz :
Assignment 4

Lecture Content (WEEK 4)

Assignment 4(Solution)

Week 5: Micro and Nano

Assignment 4

The due date for submitting this assignment has passed. **Due on 2018-03-04, 23:59 IST.**

Submitted assignment

1) Consider Rosenthal's 3D solution for temperature distribution of moving point **2 points** heat source on a semi-infinite body along the axis of moving heat source. Which one of the following statements is correct?

- Cooling rate reduces significantly by preheating
- Cooling rate increases with increasing heat input per unit length (Q/v)
- Temperature gradient decreases with decreasing heat input (Q)
- Heat loss occurs from the surface during calculation of temperature distribution

No, the answer is incorrect.

Score: 0

Accepted Answers:

Cooling rate reduces significantly by preheating

2) In an arc welding process, the arc voltage and current are measured as 13 V and **2 points** 160 A, respectively. If total amount of heat required to melt the welded sample is 1 kW and the weld thermal efficiency is 0.8, the melting efficiency in this process is

- 0.80
- 0.60
- 0.64
- 0.48

No, the answer is incorrect.

Score: 0

Accepted Answers:

0.60

3) Which one of the following is **NOT** a residual stress relieving techniques? **2 points**

- Pre-cooling the base material
- Peening
- Surface rolling
- Heat treatment

No, the answer is incorrect.

Score: 0

Accepted Answers:

Pre-cooling the base material

Joining Processes**Week 6: Welding Metallurgy****Week 7: Welding and Joining of Non-Metals****Week 8: Metal Transfer in Welding and Metal Printing**

4) Which one of the following techniques/instruments is used to measure distortion in a welded structure? **2 points**

- X-ray diffraction
- Neutron diffraction
- Hole drilling methods
- Coordinate measuring machine/dial gauge

No, the answer is incorrect.

Score: 0

Accepted Answers:

Coordinate measuring machine/dial gauge

5) In arc welding with short circuit metal transfer, the arc voltage is 20 V, arc current is 130 A and the arc is on for 85% of the total time. The rate of heat input (in kW) is estimated as **2 points**

- 0.39
- 2.00
- 2.21
- 2.60

No, the answer is incorrect.

Score: 0

Accepted Answers:

2.21

6) An arc welding process is carried out at effective heat input of 2000 W and welding speed of 4 mm/s. Assume ambient temperature of 30°C and thermal conductivity of steel is 30 W/mK. Based on Rosenthal's 3D equation of temperature distribution, the cooling rate (in K/s) along the axis of the moving arc for temperature 530°C will be **2 points**

- 40π
- 30π
- 20π
- 10π

No, the answer is incorrect.

Score: 0

Accepted Answers:

30π

7) Which one of the following is **NOT** a distortion minimization technique in a welded structure? **2 points**

- Preheating of the material
- Application of heat sinks
- Tack welding at multiple points
- Non uniform heating and cooling of sample

No, the answer is incorrect.

Score: 0

Accepted Answers:

Non uniform heating and cooling of sample

8) Which one of the following residual stress measurement techniques follows the basic principle of Bragg's law? **2 points**

- Hole drilling method
- Contour method
- Slitting method
- X-ray diffraction

No, the answer is incorrect.

Score: 0

Accepted Answers:

X-ray diffraction

9) In fusion welding process, the solidification/growth rate (R) is calculated as 12 **2 points** mm/s and the average temperature gradient (G) is 10 K/mm. The cooling rate (in K/s) is estimated as

- 120
- 60
- 12
- 1.2

No, the answer is incorrect.

Score: 0

Accepted Answers:

120

10) The linear coefficient of thermal expansion of a material is $2 \times 10^{-5} \text{ K}^{-1}$ and **2 points** Young's modulus is 250 MPa. If the temperature difference in fusion welding process is estimated as 100 K, the thermal strain is calculated as

- 0.002
- 0.025
- 0.5
- 0.05

No, the answer is incorrect.

Score: 0

Accepted Answers:

0.002

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