Assignment-5

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

Due on 2018-09-19, 23:59 IST.

1) During weld solidification, if the thermal gradient in the fusion zone is shallow, which of the following micro-structures are expected? 

- Cellular
- Dendritic
- Columnar
- Single crystalline

No, the answer is incorrect.
Score: 0
Accepted Answers: Cellular, Dendritic

2) Consider an alloy A-B being welded using a high intensity heat source. What is expected to happen to a perturbation that forms at the solid-liquid interface?

- Perturbation remains stable
- Perturbation grows into the liquid
- Perturbation melts back
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers: Perturbation melts back

3) Consider two alloys, alloy-1 with composition 0.5 wt % B and alloy-2 with 1.5 wt % B, that are being welded separately. Assume that the partition
Critical temperature gradient for alloy-1 and alloy-2 is same
Non of the above

No, the answer is incorrect.
Score: 0
Accepted Answers: Critical temperature gradient for alloy-2 is more than alloy-1

4) Pick the pair of phrases that will make the following statement true: Equiaxed microstructure 1 point is formed in the fusion zone if ___________ ahead of the solid liquid interface, typically observed in _________ welding.

- solute undercooling is small, GTAW
- solute undercooling is small, EBW
- solute undercooling is large, Laser beam welding (LBW)
- solute undercooling is large, GTAW

No, the answer is incorrect.
Score: 0
Accepted Answers: solute undercooling is large, GTAW

5) The composition and the temperature at the solid liquid interface is _________ and _________ respectively.

- \( C_0 , T_S \)
- \( C_0 , T_L \)
- \( C_0 / K , T_S \)
- \( C_0 / K , T_L \)

No, the answer is incorrect.
Score: 0
Accepted Answers: \( C_0 / K , T_S \)

6) In the constitutional supercooling of liquid during weld solidification, which of the following parameters does the critical temperature gradient \((G^*)\) depends on? 1 point

- slope of liquidus
- Interface velocity
- Solute diffusivity
- Vapor pressure

No, the answer is incorrect.
Score: 0
Accepted Answers: slope of liquidus

7) Which of the following the most accurate discretiation method in the numerical method solutions? 1 point

- Backward difference
- Forward difference
8) For the discretisation in 2-D case which of the following elements is taken into account for the numerical analysis of the weldment?  

- Triangular  
- Cuboid  
- Rectangle  
- Square  

No, the answer is incorrect.  
Score: 0  
Accepted Answers:  
Central difference

9) Which of the following statements is not correct?  

- Discretized set of equation is solved only for the interior points.  
- Discretized set of equation is not solved for the boundary.  
- Discretized set of equations is solved for all the points.  
- Values at the boundaries should be assumed to be known.  

No, the answer is incorrect.  
Score: 0  
Accepted Answers:  
Discretized set of equations is solved for all the points.

10) From the type of boundary conditions given below, which one is the most suitable for welding simulation?  

- Know value of temperature at the boundary.  
- Flux at boundary in terms of boundary temperature.  
- Flux at the boundary is known.  

No, the answer is incorrect.  
Score: 0  
Accepted Answers:  
Flux at boundary in terms of boundary temperature.

11) With respect to the discretization of the transient term, which of the following is a correct statement.  

- In case of the explicit scheme numerical stability is ensured by larger time step.  
- For implicit scheme, values from previous step can be taken as initial guess for current step.  
- For implicit scheme time steps cannot be larger than a value.  
- Explicit schemes are in general more stable than Implicit schemes.  

No, the answer is incorrect.  
Score: 0  
Accepted Answers:  
For implicit scheme, values from previous step can be taken as initial guess for current step.
12. In a gas tungsten arc welding in DCEN configuration the arc length and the electrode tip angle are 2.7 mm and 50 degrees respectively. The current distribution as a function of radius is given by a gaussian approximation \( j(r) = 17.6e^{(-0.54r^2)} \). Determine the radial distance in mm where the current density will be maximum.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 0

13. If the power density distribution as a function of electrode radius is given by \( q(r) = 65e^{(-0.27r^2)} \) then the power density in \( W/m^2 \) at a radial distance of 2 mm is ______ (up to 1 decimal place accuracy)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 21.5, 23.0

14. The easy growth direction for columnar dendrites in the case of material with fcc or bcc structure is ______

- <110>
- <101>
- <021>
- <001>

No, the answer is incorrect.
Score: 0
Accepted Answers:
<100>

15. For an Al - 4% Cu Alloy if the freezing range is \( 70^\circ C \) and \( D_L \) is \( 3 \times 10^{-5} \text{cm}^2/\text{s} \). Given that the temperature gradient is \( 700\mathbf{C}/\text{mm} \), what is the maximum growth rate (in mm/min) below which planar growth is possible during solidification. Answer up to 1 decimal place accuracy.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 1.6, 2.0

16. In continuation with the previous question find out the corresponding cooling rate in units of \( 10^6 \text{ K/s} \) up to 2 decimal place accuracy.

No, the answer is incorrect.
Score: 0
Accepted Answers:
17) In a binary phase diagram if partition coefficient is greater than 1, which of the following statements is true?

- [x] The solute content of liquid ahead of S/L interface drops during solidification.
- [x] The solute content of the solid decreases and that of the liquid increases.
- [x] The composition of the solid at the interface is greater than that of the liquid.
- [x] The composition of the liquid at the interface is greater than that of the solid.

No, the answer is incorrect.
Score: 0

Accepted Answers:

- The solute content of liquid ahead of S/L interface drops during solidification.
- The composition of the solid at the interface is greater than that of the liquid.

18) By using magnetic arc oscillation during welding, what happens to the grain structure of the fusion zone when the arc vibration is changed from parallel mode to perpendicular mode with increasing amplitude?

- [x] Grain structure becomes coarsened
- Grain structure becomes refined
- Grain size does not change
- Grain structure becomes single crystalline

No, the answer is incorrect.
Score: 0

Accepted Answers:

Grain structure becomes refined

19) In autogenous GTAW of aluminum alloys, how do you expect the dendrite arm spacing of the weld metal to be affected by preheating and why is it so.

- [x] Dendrite arm spacing increases because of increased cooling rate.
- Dendrite arm spacing increases because of lower thermal gradients
- Dendrite arm spacing decreases because of decrease in cooling rate.
- Dendrite arm spacing decreases because of higher thermal gradient

No, the answer is incorrect.
Score: 0

Accepted Answers:

Dendrite arm spacing increases because of lower thermal gradients

20) Suppose the welding speed of a regular weld is 4.2 mm/s. Calculate the increase in the velocity of the weld pool (in mm/s up to 1 decimal place accuracy) if the arc is oscillated transversely at a frequency of 1 Hz at an amplitude of 1.9 mm.

No, the answer is incorrect.
Score: 0

Accepted Answers:

(Type: Range) 4.3,4.9