Department of Material Science and Engineering National Institute of Technology, Hamirpur

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Materials Processing Techniques (ME-228) End Term Examination (2022-23) B. Tech. (MSE) IV Semester

## Duration: 3 hrs 00 Minute

## Note:

- Attempt all questions.
- Draw a well labeled diagram wherever necessary.

Question 1: Explain the following term:

(2×6=12)

Max Marks: 50

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- a) Soldering and Brazing
- b) Impregnation and Infiltration
- c) Cold shuts and Dross
- d) Hardeners and degasser for aluminum casting
- e) Compaction and Sintering
- f) TIG and MIG Welding

Question 2: Explain the Investment and shell molding casting techniques. Also mention their advantages, limitations and applications. (6)

Question 3: Calculate solidification time of the two iron castings when both are poured, with no superheat, into sand moulds at the initial temperature  $30^{\circ}$ C: (6)

1. A Slab shaped casting 8 cm thick

2. A sphere 12 cm in diameter

Also, suggest which casting will have more refined grain structure considering other variables are same.

{Data for iron is: Freezing temperature= 1539 °C, Latent heat= 272 kJ/kg, Density of molten metal= 7.8 g/cc

And for sand is: Specific heat capacity= 1.17 kJ/kg-K , k= 0.8655 W/m-K, Density of Sand= 1.6 g/cc.}

Question 4: Explain the different powder production methods with suitable diagram- 6 marks Question 5: Explain the process of hot isostatic pressing (HIP) in powder metallurgy. What are the advantages of using HIP. 3 marks

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Question 6: Differentiate between spot, Seam and Projection welding techniques. 3 marks

Question 7: Discuss the principle of solidification and the factors that affect the microstructure of a metal during solidification. 5 marks

Question 8: What is the directional solidification? Explain Bridgman-Stockbarger, Czochralskimethod and Floating zone method to achieve directional solidification.5 Marks

Question 9: Two gating design for a mould of  $50 \text{ cm} \times 25 \text{ cm} \times 15 \text{ cm}$  are shown in Fig. 1. The cross- sectional area of the gate is  $5 \text{ cm}^2$ . Determine the filling time for both the design 4 marks

