

17-Ind-B2-Manufacturing Processes

3 hours duration

Notes:

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made.
2. This is a Closed Book exam. Candidates may use one of two calculators, the Casio or Sharp approved models.
3. Any five questions constitute a complete paper. Only the first five questions as they appear in your answer book will be marked.
4. All questions are of equal value.
5. Write your answers in point-form whenever possible, but fully. Show all calculations. Please note that deduction will be made for any irrelevant issues that you included in your answer. So please be concise.

Marking Scheme (marks)

1. (i) 6.67 (ii) 6.67 (iii) 6.67
2. (i) 4 (ii) 4 (iii) 4 (iv) 4
3. 20
4. (i) 4 (ii) 4 (iii) 4 (iv) 4
5. 20
6. 20
7. (i) 10 (ii) 10

1. (i) Which of the following statements is/are true about the formation of flash in closed die forging process?

- (1) It increases the cycle time of the production.
 - (2) It enhances the flow of the metal material in the die.
 - (3) It is always a disadvantage.
- a. (1) only
 - b. (2) only
 - c. (3) only
 - d. (1) and (2)
 - e. (1) and (3)

(ii) Which of the following statement(s) is/are true about injection molding processes?

- (1) Cooling time contributes to as much as 75% of the overall injection cycle.
 - (2) Solidification starts after the mold has completely been filled.
 - (3) Material shrinkage during cooling and solidification can result in the formation of internal cavities.
- a. (1) only
 - b. (2) only
 - c. (1) and (2)
 - d. (1) and (3)
 - e. All of the above

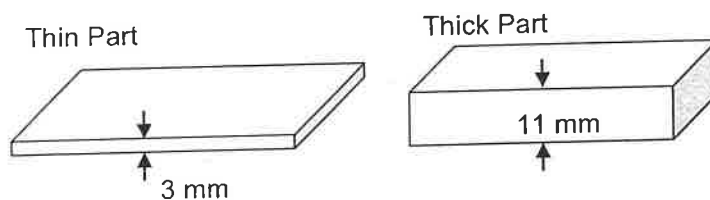
(iii) Which of the following will make a manufacturing processing technology more industrially viable?

- (1) The manufacturing processing technology is more complicated.
 - (2) The manufacturing processing technology involves more science.
 - (3) The manufacturing processing technology is more difficult to be copied.
- a. (1) only
 - b. (1) and (2)
 - c. (1) and (3)
 - d. (2) and (3)
 - e. All of the above

2. Write the name of the casting technology that is appropriate for the following description.

- (i) A cast part has a smooth surface but has a parting line. Which casting technology was used?

- (ii) A cast part has a rough surface but has a parting line and some defects. Which casting technology was used?
 - (iii) A cast part has a smooth surface without any parting line. Which casting technology was used?
 - (iv) A cast part has a smooth surface with many defects. Which casting technology was used?
3. Why does the shrinkage that occurs during the solidification process of the metal casting usually lead to the formation of cavity/porosity in the core region of the metal parts, but not the deformation of the part's geometry?
4. Answer the following questions.
- (i) Which one freezes first amongst the sprue, the runner, and the gate in injection molding?
 - (ii) How much does a metallic part typically shrink during casting?
 - (iii) How much does a polystyrene part typically shrink during injection molding?
 - (iv) Name a composite technology that uses continuous fibers.
5. Estimate the time required to solidify the following parts in injection molding.



6. Briefly describe why use of progressive dies is recommended in stamping.
7. (i) An inexperienced technician claims that the connecting rod for an internal combustion engine can be manufactured by forging and that some sections of the products need to be machined. He also claims that machining can be done first before forging because the setup time for machining can be reduced by handling the raw steel bar of a cylindrical shape. You agree with him on the selection of the manufacturing processes but not on the sequence. Describe the involved issues and justify your answer.
- (ii) Briefly describe how to drill a long hole (with a large L/D ratio) using a normal drilling machine.