

National Examinations May 2014
98-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 the calculations.

Marking Scheme (marks)

1.	(i) 6,	(ii) 7,	(iii) 7
2.	(i) 6,	(ii) 7,	(iii) 7
3.	(i) 8,	(ii) 5,	(iii) 7
4.	(i) 7,	(ii) 7,	(iii) 6
5.	(i) 8,	(ii) 6,	(iii) 6
6.	(i) 7,	(ii) 7,	(iii) 6
7.	(i) 6,	(ii) 8,	(iii) 6

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1. (i) How does steel differ from cast iron?
(ii) State the factors that govern the properties and behavior of metals and alloys during manufacturing and performance during their service life.
(iii) What are the important properties of metals and alloys that are greatly influenced by alloying elements and by heat treatment processes?
2. (i) Explain the two trends that are having a large impact on the casting industries.
(ii) What is plaster-mold casting process? Briefly explain the process.
(iii) State the most significant design considerations that are given for designing expandable-mold casting.
3. (i) A 6 in. long, $\frac{1}{2}$ in. diameter 304 stainless steel rod is being reduced in diameter to 0.480 in. by turning on a lathe. The spindle rotated at 400 rpm, and the tool is traveling at an axial speed of 8 in./min. Calculate the cutting speed and the material removal rate.
(ii) Explain the different types of metal chips and which one of them is the best?
(iii) What is a built-up edge and how it affects metal cutting operation? How can it be eliminated or minimized?
4. (i) State the general characteristics of the following forming and shaping processes: (a) forging, (b) extrusion, and (c) sheet-metal forming.
(ii) What are the steps followed in a typical forging operation?
(iii) What are the current trends in forging design and manufacturing?
5. (i) Explain the resistance welding processes and the main advantages. State the general expression (equation) for the heat generated in resistance welding.
(ii) What is the difference between resistance spot welding and resistance seam welding processes? State their advantages.
(iii) What is oxyfuel gas cutting? Explain its process capabilities.
6. (i) State the characteristics of the grinding operations: (a) surface grinding, (b) cylindrical grinding and (c) centreless grinding.
(ii) Explain the characteristics of the finishing operations: (a) coated abrasives, (b) wire brushing and (c) honing.
(iii) Explain the economics of grinding and finishing operations in the context of automating the equipment involved.
7. (i) State the application of numerical control on all aspects of manufacturing operations.
(ii) What are the advantages and limitations of numerically controlled machines compared to the conventional machines?
(iii) Explain the role of sensors in technologies other than manufacturing.