

**National Examinations December 2016**  
**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 calculations.

**Marking Scheme (marks)**

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

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1. (i) State the specific characteristics of non-ferrous alloys in general and aluminum, magnesium and copper alloys in particular.  
(ii) What are the basic advantages of plastics in comparison to metals? State the general characteristics of plastics.  
(iii) Explain the current trends that are taking place in the development, use and improvements in plastics.
2. (i) State the important factors that must be considered in casting operations. Explain the reasons for using casting processes over other manufacturing methods. (ii) What is a shell molding process? State the advantages and disadvantages of this process. (iii) What are the advantages and limitations of permanent molds casting processes (die, centrifugal, etc.)?
3. (i) What are the different types of metal chips and which one of them is the best?  
(ii) What is a built-up edge and how does it affect the metal cutting operation? How can it be eliminated or minimized?  
(iii) In an orthogonal metal cutting operation, the following data are obtained:  
Underformed chip thickness = 0.0098 inches  
Actual chip thickness = 0.0169 inches  
Rake angle =  $20^\circ$   
Determine the shear angle.
4. (i) Explain briefly the factors or parameters that influence the metal cutting processes.  
(ii) Briefly state your understanding of: (a) tool wear and failure, (b) surface finish and integrity and (c) machinability.  
(iii) What are the current trends in metal cutting processes?
5. (i) State the characteristics of grinding operations and machines. (ii) State the specific design considerations that should be given to grinding operations. (iii) Discuss the economics of grinding and finishing operations in the context of surface finish and dimensional accuracy.
6. (i) What is residual stress in a welding process? What are the detrimental effects of residual stresses?  
(ii) What factors must be considered in the selection of a joint and a welding process?  
(iii) State the future trends in welding technology.
7. (i) What are the elements of statistical process control?  
(ii) What is acceptance sampling? State your understanding of acceptance quality level (AQL).  
(iii) Explain the essentials of Deming and Taguchi methods of quality control/engineering.