

**National Examinations May 2015**  
**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) 7,	(ii) 6,	(iii) 7
3.	(i) 7,	(ii) 7,	(iii) 6
4.	(i) 7,	(ii) 7,	(iii) 6
5.	(i) 6,	(ii) 8,	(iii) 6
6.	(i) 7,	(ii) 7,	(iii) 6
7.	(i) 8,	(ii) 7,	(iii) 5

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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 basic advantages of plastics in comparison to metals. What are the general characteristics of plastics?  
(ii) Why are additives compounded with polymers/plastics? Name the typical additives generally used.  
(iii) Explain the specific characteristics of: (1) thermoplastics, (2) thermosets and (3) elastomers/rubbers.
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°  
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 factors that should be considered in the selection of a welding process for a particular operation.  
(ii) Explain the characteristics of the following welding processes including their general chemical expressions or equations, where applicable: (1) oxyacetylene, (2) arc, and (3) resistance.  
(iii) What is the basic difference between oxyfuel gas cutting and arc cutting? State the different types of arc cutting.
6. (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?
7. (i) State the advantages and limitations of numerically controlled (NC) machines over conventional machines.  
(ii) State the characteristics of direct numerical control (DNC) and computer numerical control (CNC) machines.  
(iii) State the advantages of CNC over conventional NC (DNC) machines.