

National Exams May 2009
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.

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Marking Scheme (marks)

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

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1. (i) How does steel differ from cast iron?
(ii) State the factors that govern the properties and behaviour 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) It is required to drill a 2½” diameter hole through a 4½” thick, soft cast iron machine part, with high speed drill bit. The following data are obtained from the machinist handbook:
Drill bit point angle = 118°
Drill speed, for soft cast iron (with high speed drill) = 240 rpm
Drill feed (for 1” diameter and over drills) = 0.25 in./rev.
Determine the cutting time (min.) for the drill press operations.
(ii) Explain the basic cutting fluid action in metal working operations.
(iii) Explain the effects of cutting fluids in a machining operation with particular reference to workpiece material, machine tools and biological and external environment.
3. (i) State the variables that affect metal removal rate. Explain each variable.
(ii) Explain the effects of temperature rise in metal working operations.
(iii) In a lathe machine operation, the following data are known:
Spindle speed = 300 rpm
Diameter of shaft = 10 inches
Depth of cut = 0.08 inches
Feed = 0.04 inches/revolution
Determine the metal removal rate (state the unit).
4. (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.
5. (i) What is the basic difference between hot extrusion and cold extrusion processes?
(ii) What are the advantages of cold extrusion process over hot extrusion process?
(iii) Explain the various types of extrusion defects.
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) 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.