The Open University of Sri Lanka
Faculty of Engineering Technology
Department of Mechanical Engineering

Study Programme	:	Bachelor of Technology Honours in Engineering
Name of the Examination	:	Final Examination
Course Code and Title	:	**DMX3206 Introduction to Manufacturing Processes**
Academic Year	:	2021/22
Date	:	14th February 2023
Time	:	1330 hours -1630 hours
Duration	:	**3 hours**

General instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **Eight (08)** questions in **Four (04)** pages.
3. Answer any **Five (05)** questions.
4. Answer for each question should commence from a new page.
5. This is a Closed Book Test (**CBT**).
6. Answers should be in clear handwriting.
7. Do not use Red colour pen.
8. Write name of the question paper with course code in first page of the answer book.
9. Write your index number (not the registration number) in every page of your answer book.
10. Write in the bottom of the first page of your answer book clearly the question numbers you answered.

Question 01 - *(20 Marks)*

(a) i) Explain why the understanding of manufacturing processes is essential for better products.
ii) Why is it necessary for all engineers to be familiar with manufacturing processes?
iii) What are the future trends in manufacturing?

(b) i) Name some of the common iron ores used in the production of iron and steel.
ii) In addition to the iron ores, what are the two other solid raw materials used to produce iron and steel?
iii) What is limestone used in the production of iron and steel?

(c) i) What is Metrology?
ii) What is the purpose of nondestructive testing?
iii) Differentiate the dye penetrant testing or magnetic particle inspection.

Question 02 - *(20 Marks)*

(a) i) What is an alloy?
ii) Why white cast iron is very hard and brittle?
iii) State the most important engineering property of copper that determines most of its applications?

(b) i) What is the main purpose of heat treatment of metals?
ii) What is recrystallization temperature?
iii) Explain the purpose of tempering.

(c) i) State the importance of case hardening.
ii) What is flame hardening?
iii) State the types of quenching media used in the process of quenching of steel.

Question 03 - *(20 Marks)*

(a) i) Describe the process of welding in brief.
ii) Differentiate between pressure welding and fusion welding.
iii) Explain the principle of resistance welding.

(b) i) Name the basic types of joints and welding positions used in manual metal arc welding.
ii) How the electric current and voltage effects on the quality of an arc weld?
iii) Differentiate the TIG and MIG welding.

(c) i) Write down the advantages of Thermite welding process.
ii) State the three flames used in gas welding. Which one is most preferred and why?
iii) Explain the advantages and applications of oxy-acetylene welding.

Question 04 - *(20 Marks)*

(a) i) Identify the factors affecting the weldability.
ii) Why is cleaning essential before the start of welding?
iii) What are the possible causes for cracks formation in a welding joint?

(b) i) What are the defects that are generally found in welding? Describe two of them.
ii) Distortion (warpage) is a serious problem in fusion welding, particularly in arc welding. What are the possible measures that can be taken to reduce the incidence and extent of distortion?
iii) What are the three basic categories of inspection and testing techniques used for weldments? Name few typical inspections and/or tests in each category.

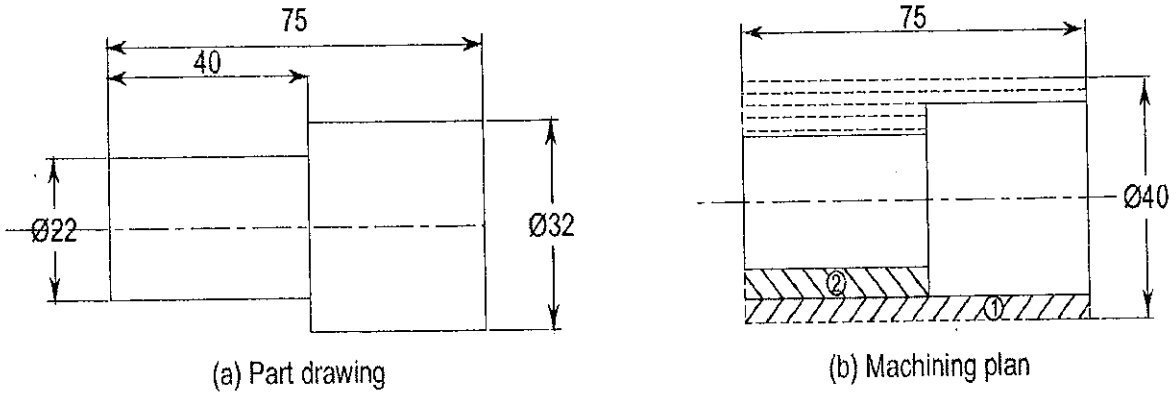
(c) i) How do brazing and soldering differ from the fusion welding processes?
ii) What is the technical difference between brazing and soldering?
iii) Distinguish brazing from soldering with respect to the filler metals used, applications and the strength of the joint.

Question 05 - *(20 Marks)*

(a) i) Name machining processes used in single point cutting tool and multi point cutting tool.
ii) What is the difference between turning and boring?
iii) State the types of cutting tool materials.

(b) i) What is the importance of headstock and tailstock of a lathe machine?
ii) Distinguish turret lathe from CNC lathe machine.
iii) Differentiate between boring and drilling.

(c) In Figure 05, a component is shown to be machined from a stock of AISI1040 steel, 40 mm in diameter and 75 mm long. Calculate the machining times required for completing the part with (i) HSS tool (ii) Carbide tool. The machining is to be carried out in two stages as pockets marked in Figure 05(b) as 1 and 2.



(a) Part drawing (b) Machining plan

Figure 05: Part drawing and Machining plan (All dimensions are in Millimeters)

Assume:

HSS tool
Cutting speed *(V)* = 30 m/min
Feed rate (f) = 0.30 mm/rev.
Depth of cut (t) = 2 mm

Carbide Tool
Cutting speed, V = 145 m/min
Feed rate, (f) = 0.38 mm/rev.
Depth of cut (t) = 2 mm

Question 06 - *(20 Marks)*

(a) i) Explain why milling is a more versatile machining operation compared to the other machining processes.
ii) Describe the different types of cutters used, in milling operations and give at least one application of each type.
iii) Distinguish milling machine from a drill machine.

(b) i) Describe End milling process with examples. Compare and contrast it with other milling processes.
ii) Explain why grinding operations are required for components that have been previously machined.
iii) Give reasons for using wide variety of types, shapes, and sizes of grinding wheels.

(c) i) How does non-traditional machining differ from conventional machining?
ii) Explain how the EDM process is capable of producing complex shapes.
iii) Why is abrasive jet machining not suitable for soft materials?

Question 07 - *(20 Marks)*

(a) i) Explain why casting is an important manufacturing process.
ii) Describe the stages involved in the metal casting process.
iii) What are the major limitations of the sand casting process? Describe in brief how are they overcome?

(b) Give a brief write up on the following casting terms:

- Sprue
- Gate
- Runner

(c) i) Which is the most widely used pattern in sand casting process? Describe its advantages.
ii) Differentiate investment casting from other casting methods.
iii) What type of products can be made by using centrifugal casting?

Question 08 - *(20 Marks)*

(a) i) Describe the process of sintering in Powder Methodology.
ii) Name few important products manufactured by Powder Metallurgy.
iii) Explain the process of injection moulding.

(b) i) What is the similarity and dissimilarity between drawing and extrusion in metal forming?
ii) How are sheet metal operations differ from bulk deformation processes?
iii) State the difference between cold working and hot working operation in metal forming.

(c) i) Give two examples for cold and hot working operations.
ii) List various operations generally performed in a sheet metal shop.
iii) Distinguish between spinning and cup drawing with reference to the processes and components produced.