

Study Programme : Bachelor of Science Honours in Engineering
Name of the Examination : Final Examination
Course Code and Title : **DMX4212 MANUFACTURING ENGINEERING**
Academic Year : 2024/25
Date : March 01, 2026
Time : 09:30 hrs. – 12:30 hrs.
Duration : 3 hours

General instructions

- 1) Read all instructions carefully before answering the questions
 - 2) This question paper consists of 05 questions. All questions carry equal marks.
 - 3) Answer all questions.
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Question 01.

- a) Define engineering metrology and explain its importance in ensuring quality, standardization, and interchangeability in manufacturing systems. (5 Marks)
- b) Distinguish between the following pairs with suitable examples: (7 Marks)
 - i. Accuracy and Precision
 - ii. Line standards and End standards
- c) Classify the different types of measurements errors. Discuss systematic and random errors and describe practical methods used in workshops to minimize such errors. (8 Marks)

Question 02.

- a) Describe the construction and working principle of a Vernier height gauge. Compare its applications with a dial indicator. (6 Marks)
- b) Define the following surface characteristics: (6 Marks)
 - i. Surface roughness (Ra)
 - ii. Waviness
 - iii. Surface lay
- c) Explain how surface finish influences friction, wear resistance, and fatigue strength of mechanical components. (8 Marks)

- a) Explain why tolerances are necessary in manufacturing processes. Discuss the economic and functional implications of specifying very tight tolerances. (6 Marks)
- b) Explain the mechanism of chip formation in orthogonal cutting and describe different types of chips produced during machining. (8 Marks)
- c) During a turning operation, the uncut chip thickness is 0.30 mm and the chip thickness after cutting is 0.90 mm. The rake angle is 10° .
Calculate:
 - i. Chip reduction ratio
 - ii. Shear plane angle
 - iii. Shear strain(6 Marks)

Question 04.

- a) Discuss the main tool wear mechanisms in single-point cutting tools, explaining crater wear and flank wear. (8 Marks)
- b) State Taylor's Tool Life Equation and explain the significance of constants n and C . (5 Marks)
- c) For a cutting tool, the tool life exponent $n = 0.25$ and constant $C = 300$:
 - i. Calculate the tool life when the cutting speed is 100 m/min.
 - ii. Determine the tool life when the cutting speed is increased to 125 m/min.
 - iii. Comment briefly on the relationship between cutting speed and tool life. (7 Marks)

Question 05.

- a) Define a machine tool and explain its essential functional elements. List four common machine tools and state their primary operations. (6 Marks)
- b) Describe the geometrical tests carried out on a centre lathe to ensure machining accuracy. Mention the instruments used for testing. (6 Marks)
- c) Compare **hot working** and **cold working** processes with respect to recrystallization temperature, strain hardening, mechanical properties, surface finish, and residual stresses. (8 Marks)

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