The Open University of Sri Lanka
Faculty of Engineering Technology

Study Programme	:	Bachelor of Technology Honours in Engineering
Name of the Examination	:	Final Examination
Course Code and Title	:	**DMX4212 MANUFACTURING ENGINEERING**
Academic Year	:	2021/22
Date	:	February 10, 2023
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 08 questions. All questions carry equal marks.
3) Answers any 05 questions only.

Question 01.

a) Distinguish between "measurement" and "metrology".
b) Discuss what you understand by line, end and wavelength standards.
c) Discuss in detail the different types of errors which can occur during the process of measurement. Also discuss the methods to reduce or eliminate such errors.

Question 02.

a) With suitable examples, explain the difference between Precision and Accuracy, Range and Span.
b) Briefly explain measuring principle and methods for evaluating surface roughness.
c) Briefly explain methods for measuring straightness and flatness with the help of neat sketches.

Question 03.

a) Explain the significance of indicating tolerance, and using standard systems of Limits and Fits in the manufacturing industry.
b) What are the systems which describes a class of fit? Explain them briefly by giving examples.
c) Determine the dimensions of hole and shaft for a fit $50H_7 g_6$. 50 mm lies between 30 and 50mm. $IT7 = 16i$, $IT6 = 10i$, $i = 0.45D^{1/3} + 0.001D$, fundamental deviations for 'H' hole = 0 and 'g' shaft = $-2.5D^{0.34}$

Question 04.

a) Illustrate with the help of a neat sketch the forces acting on tool-chip interface in turning operations.

b) Briefly explain the stages involved in formation of the built-up edges in metal cutting operations.

c) Carbide tool is used to machine a 20 mm diameter steel shaft at a spindle speed of 1000 revolutions per minute. Calculate the cutting velocity of the above turning operation.

Question 05.

a) Explain briefly the four (04) types of tool wear mechanisms encountered in metal cutting operations.

b) State five (05) necessary characteristics of cutting fluids?

c) What are the desirable material properties of cutting-tool materials? Explain why?

Question 06.

a) Briefly explain three (03) modes of tool failure in machining.

b) Illustrate the variation of cutting speed (V) against the cutting time (T) and derive Taylor's tool life relationship in usual notations.

c) Determine the n and C values in the Taylor tool life equation if tool life tests in turning yield the following data:
   when cutting speed is 32 m/min, tool life is 15 min;
   when cutting speed is 50 m/min, tool life is 12 min.

Question 07.

a) Explain the various geometrical tests that are to be done to get a better accuracy in the machine tool.

b) Explain why thermal expansion of machine-tool components is important.

c) A drilling machine is designed to have 6 speeds ranging from 100 rpm to 800 rpm. It is known that the speeds from a geometric progression.
   i.   Calculate the common ratio (ϕ) of the series of speeds and select the suitable common ratio for the gearbox from the given standard values, 1.12, 1.26, 1.41 and 1.58
   ii. Calculate the spindle speeds.

Question 08.

a) Explain what strain hardening is, and it's importance in manufacturing.

b) Briefly explain why cast products are generally weaker than the wrought products.

c) Distinguish between "hot working" and "cold working" in metal forming processes.
   Note: your answer should clearly explain the behaviour of flow stress (σ_f).