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	:	**DMX4530 /MEX4230 Production Technology**
Academic Year	:	2017/18
Date	:	January 17, 2019
Time	:	0930 hrs. – 1230 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) What are the main objectives of engineering metrology?

b) What do you understand by standards in mechanical measurements?

c) Explain different types of measurement errors encounters when measuring and propose methods of minimizing those errors.

d) Explain the term interchangeability in the context of metrology and discuss two types of interchangeability.

Question 02.

a) Explain the term 'surface roughness' and three (03) groups of surface roughness parameters.

b) Briefly explain two common techniques of measuring surface roughness.

c) Calculate the Center Line Average (CLA) and Root Mean Square (RMS) values of roughness for a graph, having 10:1 horizontal and vertical magnification for given sampling length of 1.2 mm. Values of profile peaks and valleys are shown in the graph (Figure.01) below.
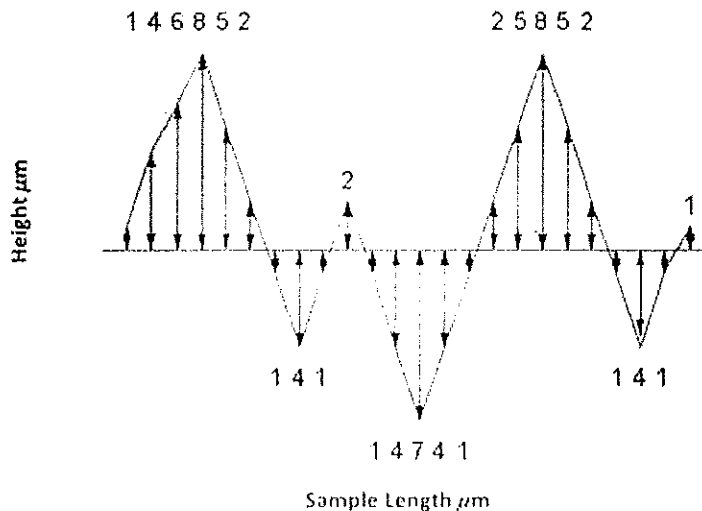
Figure. 01

Question 03.

a) Draw a screw thread profile indicating each parameter.

b) Name four (04) types of errors found in screw threads.

c) Briefly explain three (03) methods which can be used to measure the profile of a gear tooth. Classify gears according to the position of their shafts.

d) Discuss three (03) methods of gear teeth forming.

Question 04.

a) Briefly explain the difference between clearance and interference fits with suitable applications.

b) For hole and shaft pair in the fit: 20H7f8 given that, the tolerance unit $i = 0.45 \times \sqrt[3]{D} + 0.001D$ (microns), upper deviation for shaft type $f = -5.5D^{0.41}$, tolerance IT7 $= 16i$, IT8 $25i$, 20mm diameter lie in the diameter step of 18 and 30. Calculate the fundamental deviation and tolerances and hence obtain the limits of size for hole and shaft.

Question 05.

a) What are the two basic categories of cutting tools in machining? Give two examples of machining operations that use each of the tooling types.

b) Illustrate the Merchant force circle in metal cutting.

c) Briefly describe the four (04) types of chips that occur in metal cutting.

d) The chip thickness before the cut 0.30 mm and the cut yields a deformed chip thickness = 0.65 mm, rake angle 15°. Calculate the shear plane angle and the shear strain for the operation.

Question 06.

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

b) Name three (03) desirable properties of cutting-tool materials.

c) Define what is "Tool Life" and illustrate Taylor's tool life relationship.

d) The life of H.S.S tool (n= 0.2) in reducing the diameter of a bar stock from 60mm to 55mm at a speed of 110 r.p.m was found to be 2hrs. What would be the speed (rpm) if the life of the tool is to be 3.5 hrs?

Question 07.

a) Explain how does geometrical accuracy of machine tool parts influence the performance of a machine tool.

b) What are the major advantages of using geometric progression of for speed regulation in a gear box?

c) Assuming that the spindle speeds are in geometrical progression, design a five (05) speed gear box to obtain speed variation between 112rpm and 624rpm. The gearbox is driven by a motor with speed of 400rpm. The standard values of common ratios (φ) are 1.12, 1.26, 1.41, 1.58 and 1.78.

    (i) Calculate spindle speeds of gear box.
    (ii) Propose a suitable structural formula and draw the kinematic diagram.
    (iii) Construct a suitable speed diagram.

Question 08.

a) Explain the behavior of flow stress (σ_f), during cold and hot working processes.

b) What do you understand by "spring back" in bending and explain the methods used to eliminate the drawbacks of bending?

c) What are factors contribute to the cost in machining operations?