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	:	**MEX4230- Production Technology**
Academic Year	:	2015/16
Date	:	November 17, 2016
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 8 questions. All questions carry equal marks.
3. Answer any 5 questions only.

Question 01.

a. What do you understand by standards in mechanical measurements?

b. The diameter of a shaft was measured using three different length measuring instruments and the readings are represented graphically as shown in Figure Q1. Distinguish between accuracy and precision by using figures below.

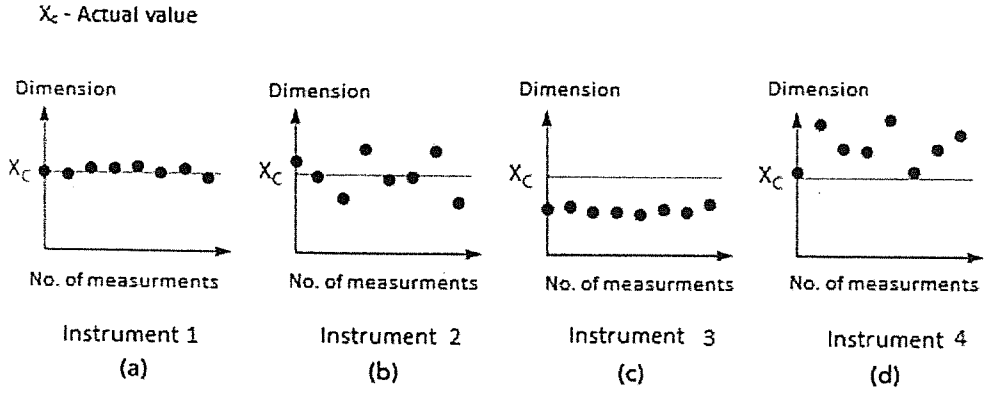


Figure Q1

c. State requirements to be considered when selecting a measuring instrument and factors affect the frequency of calibration.

d. The diameter and height of a cylindrical object is given as

Diameter: 5±0.1mm Height: 30±0.7mm

What are the ideal measuring instruments for obtaining these measurements?

Question 02.

a. Explain the importance of using standard systems of Limits and Fits in the modern manufacturing industry.

b. What are the two systems which describes a class of fit? Explain them briefly by giving examples.

c. What information can you obtain from the following symbols given on a production drawing?



Figure Q2.1

d. Calculate the tolerance and allowance of the shaft and hole given in Figure Q2.2

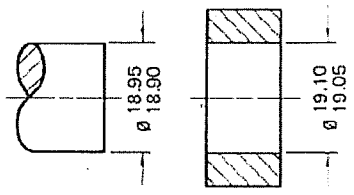


Figure Q2.2

Question 03.

a. What are the methods used in evaluating the surface finish.

b. Following information refer to the trace of a surface shown in Figure Q3.

Arears (mm^2) : A=180, B= 140, C= 150, D= 160

Magnification = 5000

Calculate the Rq value of the surface.

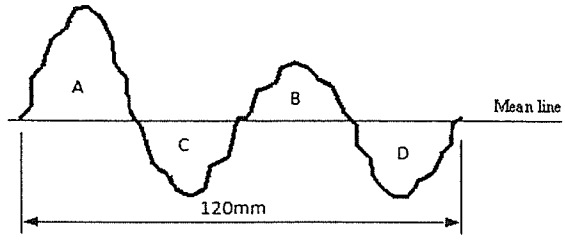


Figure Q3

c. Explain a method of measuring errors in the pitch of a screw thread.

d. What are the various methods of measuring the gear tooth thickness?

Question 04.

a. Illustrate geometry of single-point cutting tool and explain their functions.

b. What are the general types of chips formed in metal cutting? What are the factors that chip formation depends upon.

c. Explain the stages involved in the formation of the built-up edges in metal cutting.

d. Assume that in orthogonal cutting, the rake angle is 10° and the coefficient of friction is 0.5. Determine the percentage change in chip thickness when the friction is doubled.

Question 05.

a. What are the various tests conducted to check the reliability of machine tools.

b. Explain with suitable examples, the main types of spindle speeds available in machine tools.

c. Design a six speed gearbox to obtain speed variations between 100 and 320 rev/min. Assume that the spindle speeds are in geometric progression. In the design process you are required to:
   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 of the gearbox.
   iii. Construct suitable structural diagram, kinematic diagram and the speed diagram.

Question 06.

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

b. Taylor's Equation of tool life gives a relation between cutting speed and tool life. What is the main conclusion that can be drawn from this principle?

c. A carbide tool used for machining mild steel work-piece was found to give a tool life of 2 hrs while cutting at 50m/min.

i. Compute the tool life if the same tool is to be used at an enhanced cutting speed of 30% higher than the current speed.

ii. What is the speed at which the tool life will be extended to 3hrs? (You may assume a value of 0.25 for the Taylor's exponent)

Question 07.

a. Explain the terms "Engineering stress" and "True stress". Also show that the true strain (ε) is given by the expression

$$\varepsilon = ln\left({}^{A_0}/_{A}\right)$$

where, A_0 = Initial cross sectional area

A = Instantaneous cross sectional area

b. Distinguish between hot working and cold working in metal forming processes stating their advantages and disadvantages.

c. What is strain hardening? Explain the importance of strain hardening in manufacturing and how the effects of strain hardening can be eliminated.

Question 08.

Answer any three (03) of the following,

a. Clearance between the blades of a shearing machine plays a major role in shearing process of metal sheets. Explain the consequences of incorrect clearance during shearing processes.

b. For what purpose do you prefer to use alloy steels in spite of its higher material cost over carbon steels?

c. What do you understand by "spring back" in bending and explain the methods used to minimize the spring backs of bending?

d. What are the effects of lowering the friction at the tool-chip interface (with a lubricant), on the mechanics of cutting operations?

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