UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF INDUSTRIAL TECHNOLOGY

FINAL EXAMINATION

JANUARY 2016 SEMESTER

COURSE CODE	:	JQB 20603
COURSE TITLE	:	ADVANCED METROLOGY
PROGRAMME LEVEL	:	BACHELOR
DATE	:	29 MAY 2016
TIME	:	9.00 AM – 12.00 PM
DURATION	:	3 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. This question paper consists ONLY one sections.
4. Answer FOUR (4) questions ONLY.
5. Please write your answers on the answer booklet provided.
6. Please answer all questions in English only.

THERE ARE 6 PAGES OF QUESTIONS EXCLUDING THIS PAGE.

(Total: 100 marks)

INSTRUCTION: Answer only FOUR (4) questions
Please use the answer booklet provided.

Question 1

Surface topography is one of the great importance in specifying the function of a surface. The most important parameter describing surface integrity is surface roughness. In the manufacturing industry, surface must be within certain limits of roughness. Therefore, measuring surface roughness is vital to quality control of machining work piece. Figure 1 shows the element of the surface texture.

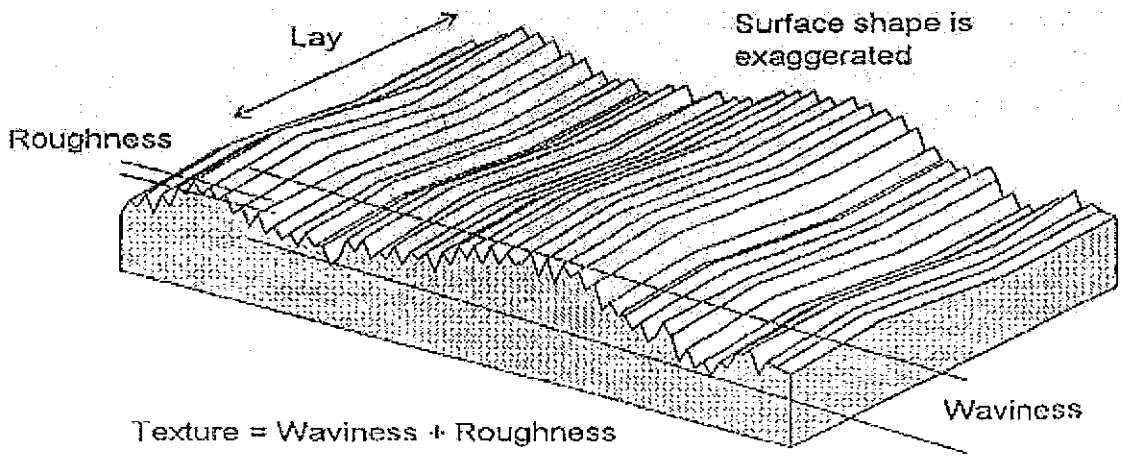

Figure 1: Surface textures include roughness and waviness.

(a) Based on Figure 1 above, describe the definition of '*Lay*', '*Roughness*' and '*Waviness*'.

(5 marks)

(b) Discuss the application of measuring surface roughness in real application industry.

(10 marks)

(c) Explain the precaution for surface roughness measurement

(10 marks)

Question 2

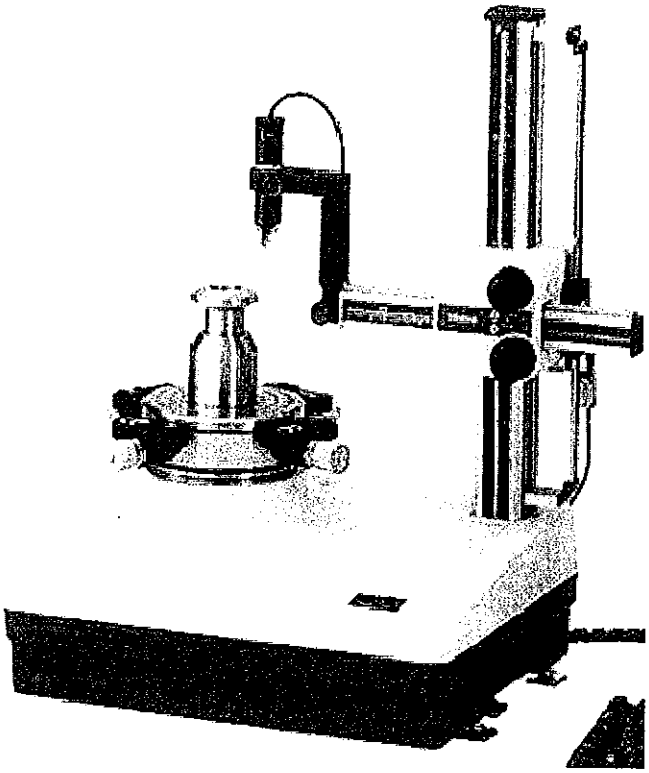

Figure 2: Roundness Measuring Machine

(a) Figure 2 shows roundness measurement machine. Based on your opinion, discuss the causes of out-of-roundness during the roundness measurement process.

(5 marks)

(b) Analyze the concept of rotation datum method. Support your answer with suitable diagram.

(10 marks)

(c) Explain **THREE (3)** precautions while measuring roundness of surface

(10 marks)

Question 3

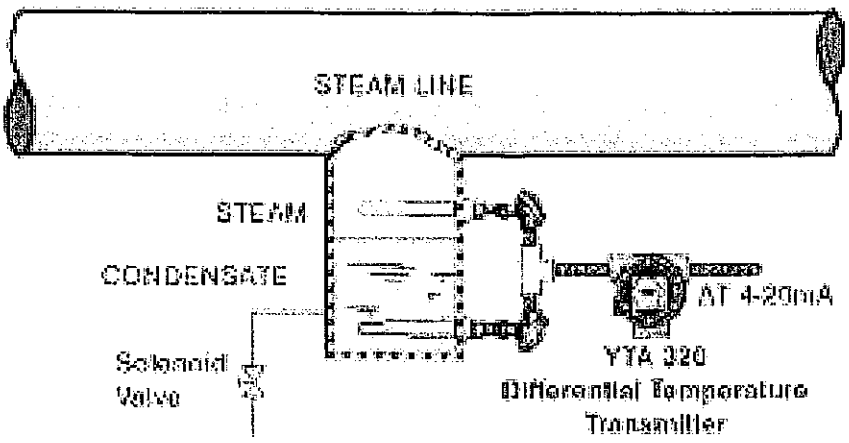

Figure 3: Application of pressure gauge in industry

(a) Figure 3 shows the application of Pressure Gauge in steam line. Identify **FIVE (5)** parameters that should be concerned when selecting a Pressure Gauge.

(5 marks)

(c) Many method have been developed for measuring temperature. In such case, the measured temperature will vary not only with the temperature of the system, but also with the heat-transfer properties of system. Classify the factors that can cause steady-state measurement error in temperature device.

(10 marks)

(d) Discuss the following temperature of measuring instrument:

i. Thermocouple
ii. Resistance Temperature Detector (RTD)

(10 marks)

Question 4

There are many types of sensing element used in the advance pressure metrology application such as Bourdon tubes, diaphragms, capsules, and bellows. All except diaphragms provide a fairly large displacement that is useful in mechanical gauges and for electrical sensors that require a significant movement.

(a) Explain in detail the concept operation of Bourdon tubes, diaphragms, capsules, and bellows. Support your answer by using suitable diagram.

(15 marks)

(b) Give your opinion regarding the implication of NOT considers pressure metrology in real industry.

(10 marks)

Question 5

Surface regularities can be quantified in term of surface roughness value as it has concerned with the size and shape of surface. In any manufacturing process, they cannot obtain any absolutely smooth and flat surface because the machinability for the workpiece are also has an effect on surface finish condition.

(a) Identify the parameter in machining process that should be considered for below categories in order to eliminate the surface defect.

i. The machining variable
ii. The tool geometry

(10 marks)

(b) Discuss the precaution in surface roughness measurement

(10 marks)

(c) Analyze the important of surface roughness technology in industry.

(5 marks)

END OF EXAMINATION PAPER