Kafr elsheikh University	Department: Production Engineering & Mechanical Design Total marks: 75 Marks	Faculty of Engineering

Course Title: Engineering Measurement
Course Code: MPD2212
Year: 2ⁿᵈ Year Production   *Final term Exam*

Date: 30-5-2019
Allowed time: 3 hrs.
No. of pages: 2

Answer all the following questions:

Q1. (20 marks)

a. Define measurement? And mention the basic information about measurement?

b. What are the types of measurement operations?

c. What are the different types of calipers in the industry? Please identify your answer with help of sketch?

d. What do you know about elements of measuring systems? Please identify your answer with help of sketch?

Q2. (25 marks)

1- How to measure the following dimension by gage blocks

- **5.615 mm, 6.120mm**
- Select the gage blocks from the blow table.

مقدار التزايد (الخطوة) (mm)	أطوال القوالب (mm)	عدد القوالب
0.005	من1.005إلي 1.01	2
0.01	من1.02إلي1.10	9
0.1	من1.20إلي1.90	9
1	من1إلي10	10
10	من20إلي30	2
30	60	1

2- Describe the gages used in difficult transferring dimension and not available in ordinary measurement devices?

3- Explain in details each of the following:

1) Mechanical amplification.

2) Fluid amplification.

3) Optical amplification.

4) Electrical amplification.

4- Discuss and explain your experimental project in this course?

Q3. (10 marks)

a. A force transducer with sensitivity of 2mV/V and maximum capacity of 50 ton is used in a platform scale. If the excitation of the sensor circuit is 5V, obtain the force (ton)-output (volt) equation and calculate the sensor output if the vehicle weight was 30 ton.

b. In order to calculate the principal stresses in a test sample three strain gauges at used at different angles as shown in fig. (1). The following reading are obtained:

Gauge number	strain
1	$850*10^{-6}$
2	$-100*10^{-6}$
3	$350*10^{-6}$
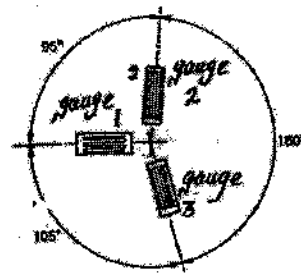
Calculate the principal strains.

Fig. (1): Three strain gauges at three different angles.

Q4. (20 marks)

i. Explain in details with simple drawing the source of error in measurement equipment;

ii. Define the calibration of measuring, and mention the steps of calibration?

iii. Explain in details with drawing the following Torque measurement:

a- Torque measurement by mechanical technique.

b- Torque measurement by electrical technique.

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with my best wishes