

Menoufia University  
Faculty of Engineering  
Prod. Eng. & Mech.  
Design Dept.

Third Year  
Metrology & Calibration  
Three Hrs.  
6 / 6 / 2015

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*This Exam measures ILOS no. (a1-1,a14-1,a14,a19-1 ,b13-1).*

**Answer all the following questions:**

**Question ( 1 )**

- a. Name the various types of pitch errors found in screw? (Draw and explain).
- b. Name the various methods of measuring the minor diameter of the thread? (Draw and explain one method).
- c. Name the various methods used for measuring the major diameter of the thread? (Draw and explain one method).
- d. Name the various methods for measuring pitch diameter? (Draw and explain one method).

**Question ( 2 )**

- a. What are the direct angular measurements methods? (Draw and explain one method).
- b. Draw and explain a method for measuring workpiece tapered on one side ( $< 45^\circ$ ).
- c. Draw and explain the method for measuring the angle of a tapered hole.
- d. What are the two methods used in measuring radius of concave shape. (Draw and explain one method only)?

**Question ( 3 )**

- a. Explain the calibration method of a precision polygon.
- b. What is auto collimator? With neat sketch explain the working principle of micro optic auto collimator?
- c. Draw and explain the alignment telescope.
- d. Explain the working principle of Angle dekkor and how the job of angle:  $43^\circ 24' 12''$  is checked.

**Question ( 4 )**

- a. 27 tooth gear of module 4 is to be checked by measuring the distance over two pins inserted in the tooth spaces at opposite sides. Calculate the following;  
- Pin diameter – Dimension expected over the pins-Deduce the used relations.

See Page (2)

b. Describe the comparator of David Brown base tangent, and explain how it can be used to measure base tangent of gear.

c. Describe a method for inspection teeth to teeth pitch.

**Question (5)**

a. Show how the auto-collimator is used for measuring the straightness of M/C bed. Also, show how the angle readings may be converted into errors of the straightness.

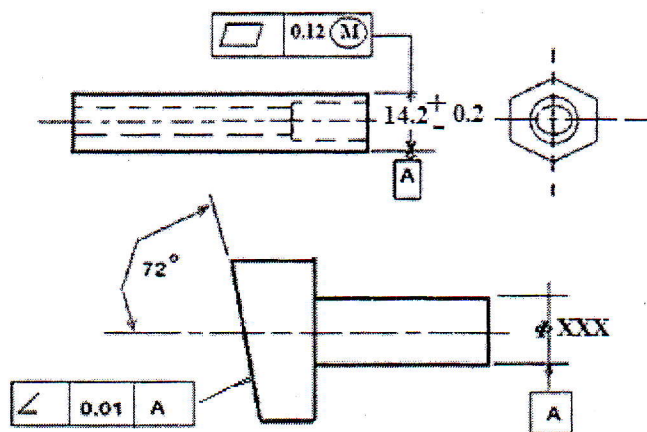
b. Check the perpendicular of axis of drilling machine to its bed.

c. Explain how to check the bore of over arm support Bracket co- axial with spindle of horizontal milling machine.

**Question (6)**

a. Explain how to check the flatness of the surface and the straightness of the centre line.

b. Explain the relations shown in Figure below and show how to check these values.



(Exam Marks):

Question No.	1	2	3	4	5	6
Marks	15	15	15	15	15	10