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BME-014

01074

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

Term-End Examination

December, 2010

BME-014 : METROLOGY AND INSTRUMENTATION

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt **any seven** from the following questions. Use of calculator is allowed.*

1. (a) What is a sine bar ? Explain its use with the help of a dial indicator. 5+5

   (b) What are different light sources used in interferometer ? Explain how interferometry can be used in finding vertical difference between two points on a machined surface.

2. (a) What is the relationship between sensitivity and range ? What is disadvantage of very sensitive instruments ? 5+5

   (b) A vernier scale consists of 25 divisions on 12 mm spacing and the main scale has 24 divisions on 12 mm. What is the least count?

3. (a) Sketch and describe the working principles and uses of any one of the following : 5+5

(i) outside micrometer.

(ii) inside micrometer.

(iii) depth micrometer.

(b) State principle of optical projector and explain how the image is obtained on the screen. What are different applications and advantages of optical projector ?

4. (a) Describe the use of (i) slip gauges and (ii) angle gauges for measuring and comparing lengths and angles. 5+5

(b) What points you will keep in mind in selecting the tolerance between the piston and cylinder of a steam engine ?

5. (a) Describe in brief the principle of auto - collimator. 5+5

(b) Sketch a universal level protractor and state why it is called universal in comparison with a normal protractor.

6. (a) What is the difference between relative error, random error, and systematic error ? 5+5

(b) One manufacturer of a co-ordinate measuring machine has indicated its accuracy as :

3σ	accuracy :	±	0.003 mm
2σ	accuracy :	±	0.002 mm
1σ	accuracy :	±	0.001 mm

What do you understand by the statement?

7. (a) What is fit ? Name the three main types of fits with their uses and suitable sketches. 5+5

(b) State the importance of limits and fits in large - scale production.

8. (a) Explain the terms. 5+5

(i) Tolerance

(ii) Allowance

(iii) Basic size

(iv) Standard size and

(v) Nominal size

(b) A hole and shafting system has the following dimensions $50\ \frac{H_g}{C_8}$

The standard tolerance is given by

$i = 0.45\left(\sqrt[3]{D}\right) + 0.001\ D$

Where D = dia (mm) of geometric mean of steps. i = standard tolerance, microns.
The multiplier for grade 8 is 25. The fundamental deviation for shaft C, for D> 40 mm is given by − (95+0.8D) microns.
The diameter range lies between 50 to 80 mm.
Sketch the fit and show these upon the actual dimension of hole and shaft.

9. (a) Explain with a neat sketch any type of comparator and show clearly the advantages of magnification adopted. 5+5

(b) Explain why it is preferred not to use a sine bar for generating angles larger than 45° if high accuracy is demanded.

10. (a) How are angular measurements made? Describe the instrument for angular measurement correct upto a few seconds. 5+5

(b) Sketch a dial indicator and explain its working mechanism clearly indicating how magnification is achieved.