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10ME/AU42B

Fourth Semester B.E. Degree Examination, Dec.2015/Jan.2016

Mechanical Measurements and Metrology

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Define the term "metrology" as applied to engineering industry. State and explain the objectives of metrology. **(06 Marks)**

b. Explain with an illustration how end standard can be derived from the line standards. **(08 Marks)**

c. Build following dimensions using M112 set: i) 35.4875 mm, ii) 78.3665 mm. M112 slip gauge set contain following:

Ranges	Steps	Pieces
1.0005	-	1
1.001 – 1.009	0.001	9
1.01 – 1.49	0.01	49
0.5 – 24.5	0.5	49
25.0 – 100.0	25.0	4

(06 Marks)

2 a. What are the concepts of interchangeability and selective assembly? Which is advantageous? **(06 Marks)**

b. Design the general type GO and NOGO gauges for the component having 25 H_7/f_8 fit. Given the following with usual notations:

i) i in microns = $0.45\sqrt[3]{D} + 0.001$ D

ii) Upper deviation for f shaft = $-5.5\ D^{0.41}$ in microns

iii) 25 mm falls in the diameter step of 18-30 mm. IT7 = 16i, IT8 = 25i.

Take wear allowance as 10% of gauge tolerance. Name the fit and mention the allowances of above fit. **(14 Marks)**

3 a. Explain with a neat sketch, construction and working of "Johnson Mikrokator" comparator. **(08 Marks)**

b. Explain the principle and working of "Zeiss Ultra Optimeter" with a neat sketch. **(08 Marks)**

c. Build an angle of 35°32′36″ from the following set of angle gauges:

Series I : 1°, 3°, 9°, 27° and 41°

Series II : 1′, 3′, 9′ and 27′

Series III : 3″, 6″, 18″ and 30″. **(04 Marks)**

4 a. Explain the 3-wire method of finding the effective diameter of screw threads. **(08 Marks)**

b. What is the principle of interferometry? How is it adapted in optical interferometer? **(07 Marks)**

c. What are the uses of (i) sine centre, (ii) clinometers, (iii) angle gauges? **(05 Marks)**

PART – B

5 a. Explain the following:

i) Hysterisis ii) Accuracy and precision

iii) Sensitivity iv) Repeatability and linearity **(08 Marks)**

b. State the advantages of electric transducer over other transducers. **(04 Marks)**
c. Discuss with a block diagram generalized measurement system with examples for each stage elements. **(08 Marks)**

6 a. Explain ballast circuit with a neat sketch. **(06 Marks)**
b. Explain the working principle of CRO and give its applications. **(10 Marks)**
c. State the advantages of electrical signal conditioning elements. **(04 Marks)**

7 a. Explain with a neat sketch, the working of hydraulic dynamometer. **(10 Marks)**
b. Explain with a neat sketch, McLeod Vacuum gauge. **(10 Marks)**

8 a. What are the necessary precautions to be taken while mounting strain gauges? **(06 Marks)**
b. Explain with a neat sketch any one type of mechanical strain gauge. **(08 Marks)**
c. What is a thermocouple? State the laws of thermocouple. **(06 Marks)**

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