GANPAT UNIVERSITY

B. Tech. Semester:6th Mechatronics Engineering

CBCS Regular Examination April - June 2015

2MC602 Metrology & Instrumentation

Time: 3 Hours   Total Marks: 70

Instruction: 1. Figures to the right indicates full marks of each question.
2. Use pencil to draw the sketch.
3. Write answer to the point.

Section - I

Que. – 1 [A] Define the term 'Metrology' as applied to engineering industry. State its significance in modern industries.   4

[B] Define the terms "Precision" and "Accuracy" with suitable examples and describe the methods to achieve them.   4

[C] Discuss briefly the following: 4
(1). Primary Standards,(2). Secondary Standards,(3). Tertiary Standards,
(4). Working Standards.

OR

Que. – 1 [A] Differentiate between Systematic error and Random error.   4

[B] Explain the effect of the following on precision measurement: 4

(1) Support (2) Alignment (3) Contact pressure.

[C] Give the advantages of Wavelength Standard.   4

Que. – 2

[A] Define the following terms: 4
(1). Tolerance, (2). Fundamental Deviation, (3). Basic Shaft, (4). Fit.

[B] Design the general type Go and No Go gauge for components having 20H7f8 fit.   7
Given:
(I). i (micron) = $0.42 (D)^{1/3} + 0.001 D$
(II). Upper Deviation of 'f' shaft = $-5.5D^{0.41}$
(III). 20 mm falls in the diameter step of 18 mm to 30 mm
(IV).IT7 = 16i
(V). IT8 = 25i

OR

Que. – 2

[A] Differentiate between Hole Basis System Stand Shaft Basis System.   4

[B] For each of the following hole and shaft assembly, find shaft-tolerance, hole-tolerance and state whether the type of fit is
(I) Clearance, (II) Transition (III) Interference.   7

      (a) Hole: $50^{+0.25}_{+0.00}$ mm   Shaft : $50^{+0.05}_{+0.005}$ mm

      (b) Hole: $30^{+0.05}_{+0.00}$ mm   Shaft : $30^{-0.02}_{-0.05}$ mm

      (c) Hole: $25^{+0.04}_{+0.00}$ mm   Shaft : $25^{+0.06}_{+0.04}$ mm

Also represent the limits, tolerance and allowance of hole & shaft with neat sketch.

Que. – 3   Attempt any three: 12

[A] Explain with neat sketches the methods of measuring 'minor diameter' of a screw thread by using a bench micrometer.

[B] Describe the following threads:
(1). British Standard withworth thread, (2). Knuckle thread,
(3). Square thread, (4). Acme thread.

[C] Name the various methods used for measurement of tooth thickness and explain any one of them.

[D] Describe the base tangent method used for measuring gear tooth thickness.

Section – II

Que. – 4   (A) Explain any one of absorption type dynamometer used for power measurement.   6

      (B) Explain construction and working of D.C Dynamometer.   6

OR

Que. – 4   (A) State the probable errors in caliper with neat sketch and explain the methods to erect them.   6

      (B) Write short note on Vernier Bevel Protractor.   6

Que. – 5   (A) Explain working of a Pirani vacuum gage with advantages and disadvantages.   6

      (B) Draw neat sketch of proving ring and explain working of it.   5

OR

Que. – 5   (A) Explain following effects occurs in thermocouple
(1) Seebeck effect (2) Peltier effect (3) Thomson effect   6

      (B) Write short note on optical pyrometer.   5

Que. – 6   Attempt any three: 12

      (A) Explain nutating disc meter used for flow measurement.

      (B) How the flow measurement devices are classified?

      (C) What is Hot wire anemometer?

      (D) Explain Hydraulic (Fluid friction) dynamometer.

END OF PAPER