

**GANPAT UNIVERSITY**  
**B.TECH SEM. VI MECHATRONICS ENGINEERING**  
**REGULAR EXAMINATION MAY - 2013**  
**2MC 602 / MC 602: METROLOGY AND INSTRUMENTATION**

TIME: - 3 HOURS

TOTAL MARKS-70

- INSTRUCTIONS:** (1) All questions are compulsory.  
 (2) Assume suitable data if necessary.  
 (3) Figure to the right indicates full marks.  
 (4) Scientific calculator is allowed.

## SECTION - I

- Que.-1** (a) Define Metrology. Explain the need of metrology in our daily life. 04  
 (b) Differentiate between Systematic error and Random error. 04  
 (c) Briefly describe the following: 04  
 (i) Interchangeable assembly  
 (ii) Selective assembly.
- OR**
- Que.-1** (a) Explain various standards of measurement. 06  
 (b) Define the following terms: 06  
 (i) Loading error  
 (ii) Calibration  
 (iii) Sensitivity
- Que.-2** (a) State how surface finish is designated on drawings. Also represent a surface 06  
 in which the surface finish on the milled surface is not to exceed  $5\mu\text{m Ra}$   
 with cut-off length 2mm, machining allowance 0.5mm and the direction of  
 lay is parallel.  
 (b) Explain the working of Tool Maker's Microscope. Also give its applications. 06
- OR**
- Que.-2** (a) What are the various essential characteristics of a comparator? 04  
 (b) A metric thread of pitch 2 mm and thread angle  $60^\circ$  is inspected for its pitch 04  
 diameter using 3-wire method. Determine the diameter of the best size wire  
 in mm.  
 (c) Explain the four types of pitch errors in screw thread. 04
- Que.-3** Design the general type GO and NO-GO gauge for components having 11  
 $20\text{H}7\text{f}8$  fit. Given:  
 (a)  $i$  (microns) =  $0.45(D)^{1/3} + 0.001D$   
 (b) Upper deviation of 'f' shaft =  $-5.5 D^{0.41}$   
 (c) 20 mm falls in the diameter step of 18mm to 30mm.  
 (d)  $\text{IT}7 = 16i$   
 (e)  $\text{IT}8 = 25i$   
 (f) Wear allowance 10% of gauge tolerance.

## SECTION - II

- Que.-4 (a) What is transmission dynamometer? Explain its working. 06  
(b) Give the construction and working of Optical Pyrometer. 06
- OR
- Que.-4 (a) Make the line diagram for pressure measurement and define various types of pressures. 06  
(b) Give the working principle of McLeod Gauge. Derive its formula for pressure measurement. 06
- Que.-5 (a) Explain the following mechanical gauges: 08  
(i) Bourdon Tube Pressure Gauge  
(ii) Diaphragm Gauge  
(iii) Vacuum Gauge.  
(b) Differentiate between thermistor and RTD. 04
- OR
- Que.-5 (a) Enlist various torque measurement methods. Explain any one. 06  
(b) What is the working principle of Venturimeter? Derive the formula for coefficient of discharge for a Venturimeter. 06
- Que.-6 (a) A linear resistance potentiometer is 100mm long and is uniformly wound with a wire having a resistance of 10,000  $\Omega$ . Under normal condition, the slider is at the center of the potentiometer. Find the linear displacement when the resistance of the potentiometer as measured by a Wheatstone bridge for two cases is 05  
(i) 3850  $\Omega$ .  
(ii) 7560  $\Omega$ .  
(b) Enlist various force measuring techniques. 02  
(c) Explain the DC Tachometer generator with a neat sketch. 04

End of Paper