

2010 ME6303 Advanced Metrology and Computer Aided Inspection – Test 1

Max. Marks: 20

Approved tables are permitted

Time: 50 minutes

1. Define the terms, error and correction, and differentiate between them. (4 marks)
2. The moment of inertia  $I$  of a solid cylinder of diameter  $D$  and mass  $M$  rotating about its principal axis is given by  $I = \frac{MD^2}{8}$ . The mass of the shaft was measured five times with results 124, 123, 126, 127, and 122 kg. The diameter was measured as 0.103 m using a scale of least count 2 mm, and repeated readings did not show any difference. Determine a 90% expanded uncertainty interval for  $I$ . (8 marks)
3. A drug inspector randomly sampled a bottle of medicine from a factory. It was weighed with medicine and after emptying the medicine, five times as follows

Reading No	1	2	3	4	5	Average	Standard deviation
Total Mass (g)	142	146	142	147	143	144	2.345208
Bottle Mass (g)	37	41	38	45	44	41	3.535534

Estimate the correlation between total mass and bottle mass readings. Estimate the standard uncertainty in the mass of medicine in the bottle, considering the correlation.

(8 marks)