

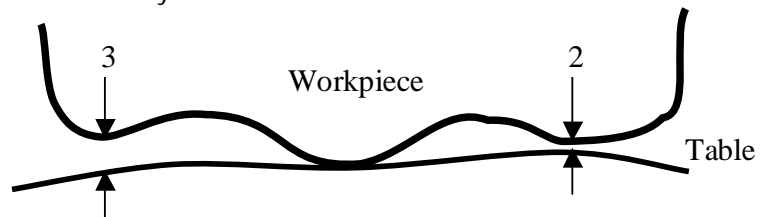
2012 ME6303 ADVANCED METROLOGY AND COMPUTER AIDED INSPECTION TEST II

Max. Marks: 20

Time: 60 minutes

(All questions carry two marks each, unless otherwise mentioned)

1. The angle of refraction r for a light ray in a medium of refractive index n which is incident from vacuum at an angle i is obtained from Snell's law: $\sin(r) = n \sin(i)$. The angle of incidence was measured five times with the result: 24, 25, 23, 22, and 24 degrees. The refractive index is obtained from a handbook as 1.54 with an error definitely not exceeding 0.05. Predict the angle of refraction and its associated 90 % expanded uncertainty. Hint: 180 degrees = π radians. (6 marks)
2. Determine the lag 2 autocorrelation for the series 1, 3, 5, 4, 1.
3. Park Lane company manufactures cheap T shirts whose chest width of is specified as 50.8 +/-0.5 cm and length 71.8 +/-0.5 cm. A sample on measurement showed a width of 51.35 cm with expanded uncertainty $U=0.1$ cm. Is the shirt acceptable for a guard band of a) 100 % b) 40 %. Give reasons.
4. Discuss the materials used for structural elements of CMMs.
5. Explain the four functions of evaluation software in CMMs.
6. Explain the problem with uniform sampling strategy, while measuring with a CMM.
7. Explain the hardware factors that affect the uncertainty of CMM measurement results.
8. Has the workpiece in the figure on the right been placed correctly with reference to the table as the datum? Explain with respect to the rule concerned.



SOLUTIONS TO NUMERICALS:

$$1. \quad r = \sin^{-1}(n \sin i)$$

$$c_n(r) = \frac{\sin i}{\sqrt{1 - (n \sin i)^2}}$$

$$c_i(r) = \frac{n \cos i}{\sqrt{1 - (n \sin i)^2}}$$