Reg. No. : | | | | | | | | | | | | |

**Question Paper Code : 10878**

M.E./M.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

Second Semester

Manufacturing Engineering

MF 4202 – ADVANCES IN METROLOGY AND INSPECTION

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is meant by "sensitivity" in a reference to an instrument?
2. Which term best describes the distinction between "correction" and "correction factor"?
3. What is the justification for studying surface metrology as a specialized subject?
4. Define surface roughness.
5. What factors primarily influence laser interferometer accuracy?
6. What are the applications of laser interferometry?
7. List the drawbacks of CMM.
8. Define laser scanning gauge.
9. What are the capabilities of human vision system?
10. Write short notes on image processing.

PART B — (5 × 13 = 65 marks)

11. (a) Explain why there is a need for standardized measures in today's advanced industrial system, and give a definition of the concept of traceability in relevance to standards.

Or

(b) Determine the expression for the step response of a system that is of the second order.

12. (a) (i) What is a cut-off wavelength? (4)

(ii) How is the interferometry technique useful for measurement of surface irregularities? (9)

Or

(b) (i) Describe the different approaches that may be used to evaluate surface finish. (8)

(ii) Provide an explanation of the symbols that are used in the depiction of surface texture. (5)



13. (a) (i) How does an angle dekkor differ from an autocollimator? (6)

(ii) Discuss the applications of an angle dekkor in metrology. (7)

Or

(b) (i) What are the various kinds of light sources that are available? Discuss. (6)

(ii) Provide an explanation of the operating concept of the DC Laser interferometer along with a nice illustration. (7)

14. (a) (i) Explain the most common reasons for errors in CMM? Discuss. (5)

(ii) Outline the procedures for operating and managing a CMM. (8)

Or

(b) Using the diagram, briefly describe the technique for assessing the flatness of a surface.

15. (a) Briefly explain the following in relation to a machine vision system: (i) Segmentation (ii) Thresholding (iii) Edge detection (iv) Feature extraction

Or

(b) How does on-line/in-process inspection differ from on-line/post-process inspection?

PART C — (1 × 15 = 15 marks)

16. (a) A 25mm H8-f7 fit is to be checked. The limits of size for H8 hole are: High limit 25.033mm, low limit 25.000mm. The limits of size for +7 shafts are: High limit 24.980mm, low limit 24.959mm. Taking gauge maker's tolerance to be 10% of the work tolerance. Design plug gauge and gap gauge to check the fit.

Or

(b) Explain in detail various industrial applications of machine vision system quoting suitable examples.