Reg No.:_____   Name:_____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (S, FE) / S4 (PT) (S, FE) Examination January 2024 (2015 Scheme)

Course Code: ME312
Course Name: METROLOGY AND INSTRUMENTATION

Max. Marks: 100   Duration: 3 Hours

PART A
Answer any three full questions, each carries 10 marks.   Marks

1	a)	What is the need of calibration? Explain the classification of various standards	(4)
	b)	Describe the different types of error in measurement and their causes and control methods in detail?	(6)
2	a)	Why are sine bars not used for measuring large angles	(4)
	b)	Explain the working principle of Read type mechanical comparator	(6)
3	a)	Discuss in detail about the various types of limit gauges with neat sketch.	(5)
	b)	Explain the application of optical flat in surface measurement with a neat diagram.	(5)
4	a)	Calculate the limit of sizes and type of fit for a 25mm shaft and hole pair designated H8d9. The relative magnitude of tolerance grade IT8 is 25i and IT9 is 40i. The formulae for fundamental deviation of shaft 'd' is $-16D^{0.44}$ microns. The diameter step for 25 mm is 18 to 30 mm.	(6)
	b)	Write short notes on interchangeability.	(4)

PART B
Answer any three full questions, each carries 10 marks.

5	a)	Define various terminologies of screw thread with suitable diagrams.	(5)
	b)	Define the terms roughness and waviness with reference to surface roughness measurement. What are the various factors affecting surface roughness of a machined component?	(5)
6	a)	Explain the Taylor Hobson Talysurf direct method of surface finish measurements.	(6)
	b)	Derive the expression for finding the effective diameter of a screw thread by three wire method.	(4)

7 a) Discuss the types and constructional features of CMM. (6)

   b) List the types of probes used in CMM and its applications in metrology. (4)

8 a) Define machine vision. Name the four types of machine vision systems. (6)

   b) Give a brief idea on the applications of machine vision system. (4)

PART C
Answer any four full questions, each carries 10 marks.

9 a) Draw the block diagram of generalized measurement system and explain different stages with examples. (6)

   b) What is the difference between range and sensitivity of a measuring instrument? (4)

10 a) What are the factors affecting the inherent characteristics of measuring instruments? (4)

    b) What do you understand by the term static and dynamic characteristics of an instrument? Explain any two characteristics from each with examples. (6)

11 a) What is the working principle behind strain gauges? What are load cells? (5)

    b) Define what is meant by a transducer and state their operational characteristics. (5)

12 a) What do you understand by direct comparison and indirect comparison method of measuring force? Give examples. (5)

    b) Explain the different types of bonded strain gauges with neat sketches. (5)

13 a) Write short note on vibration measurement. (5)

    b) Using a neat sketch, Explain torque measurement using electrical dynamometers. (5)

14 a) What is the working principle of thermocouple? Name the materials used for thermocouples. (4)

    b) With a neat diagram explain the working of Optical pyrometer. (6)

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