MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

V SEMESTER B.TECH. (AERONAUTICAL/AUTOMOBILE ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2022

SUBJECT: Metrology and Digital Manufacturing [AAE-3174]

REVISED CREDIT SYSTEM

(01/11/2022)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

Q No	Question	Marks	CO attained	BT level
1A	Define Metrology and discuss about the importance of metrology in establishing measurements.	**2**	**1**	**2**
1B	Discuss the classification of measurements standards.	**3**	**1**	**1**
1C	A hole and Shafting system have the following dimensions 50 H8/c8. The Standard tolerance is given by i= 0.45 ($\sqrt[3]{D}$) + 0.001D, where D= Dia. (mm) of geometric mean of steps, i= Standard tolerance, in microns The multiplier for the grade 8 is 25. The fundamental deviation for the shaft c, for D>40 mm is given by –(95 + 0.8 D) microns The diameter range lies between 50 to 80 mm. Also design Go and No-go Gauges	**5**	**1**	**4**
2A	Prepare a stack of slip gauges for height 34.468 by using a slip gauge of M45:	**3**	**1**	**3**
2B	Explain how slip gauges can be used in workshops, also, explain the steps involved in wringing phenomenon and principle behind the adhesion of the slip gauges.	**3**	**2**	**2**

(1) Set M 45 (Normal set)

Range (mm)	Steps (mm)	No. of blocks
1.001 – 1.009	0.001	9
1.01 – 1.09	0.01	9
1.1 – 1.9	0.1	9
1 – 9	1	9
10 – 90	10	9

2C	Discuss the classification used in evaluation of uncertainty with the help of probability distribution curve.	**4**	**2**	**2**
3A	State different symbols used in GD&T and its meaning.	**3**	**2**	**2**
3B	With a neat sketch discuss the magnification principle of mechano-optical comparator	**3**	**2**	**3**
3C	With a neat sketch show the different configuration of CMM machines	**4**	**3**	**2**
4A	Discuss the 3 types of methods used in numerical assessment of surface roughness	**3**	**3**	**3**
4B	With a sketch explain the working principle of autocollimator	**3**	**3**	**2**
4C	With a neat sketch discuss the working of Tomlinson surface measurement device	**4**	**3**	**2**
5A	Explain how the Machine to Machine (M2M) ecosystems works with a flow chart depicting the same.	**3**	**4**	**2**
5B	Explain the 4 stages of IoT Architecture with a flowchart depicting the same.	**3**	**4**	**3**
5C	What is Cyber security? Discuss the structure of futuristic industrial plant in industry 4.0 keeping smart factories as the center of importance.	**4**	**4**	**3**