Q. Code:615365

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

B.E. / B.TECH. DEGREE EXAMINATIONS, MAY 2024

Fourth Semester

MN22409 – METROLOGY AND INSTRUMENTATION: THEORY AND PRACTICES

(Tolerance grades, deviation tables are permitted)

(Regulation 2022)

TIME: 1 HOUR 30 MINUTES **MAX. MARKS: 50**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Understand the working principles of linear and angular measuring instruments	**2**
CO 2	Acquire an overview of mechanical measurement systems and principle of instruments for motion and dimension measurement	**2**
CO 3	Select the suitable transducer to perform the real time measurements.	**3**
CO 4	Calibrate the measuring devices suitable for industrial measurements.	**4**
CO 5	Use the advanced systems for real time and industrial measurements.	**3**

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Summarize the limitations of sine bar.	**1**	**2**
2.	Brief Taylor's principle of gauge design.	**1**	**2**
3.	In a shaft-hole assembly, negative allowance was observed. find the type of fit and justify.	**2**	**2**
4.	For a spur gear module was found to be 5. Calculate the number of teeth in the gear, if the pitch circle diameter is 100 mm.	**2**	**2**
5.	List the advantages of Magnetic flow meter.	**3**	**2**
6.	Sketch pneumatic load cell and name its elements.	**3**	**2**
7.	A linear measuring instrument reads 8. 63 mm against a true value of 8.50 mm. Calculate the error in the instrument. How is the error corrected?	**4**	**3**
8.	How is a precision instrument calibrated?	**4**	**2**

9.	Can you suggest how the basic Michelson interferometer could be improved?	**5**	**3**	
10.	How are coordinate measuring machines classified based on operations?	**5**	**2**	

PART- B (2 x 10 = 20 Marks)

		Marks	CO	RBT LEVEL
11. (a)	With a neat sketch, discuss how the straightness is tested on a surface plate using an auto collimator.	**(10)**	**1**	**2**
	(OR)			
(b)	With neat sketches, explore the advantages of base tangent method over constant chord method in the testing of spur gears.	**(10)**	**1**	**2**
12. (a)	Temperature is to be measured in a heating furnace. Suggest a non-contact measuring instrument. With neat sketches, explain its working principle.	**(10)**	**3**	**3**
	(OR)			
(b)	Recommend a non-intrusive type of flow meter to measure the flow rate of a non-conductive fluid. Justify your selection and explain the working of the setup with neat sketches.	**(10)**	**3**	**3**

PART- C (1 x 10 = 10 Marks)

(Q.No.13 is compulsory)

		Marks	CO	RBT LEVEL
13.	In a standard assembly, the hole basis system is utilized for a 29 mm shaft and hole pair labeled as H8d6. The provided information includes: i) The diameter step for calculating the geometric mean ranges from 18 to 30. ii) The formula for determining the tolerance value 'i' is: $i = 0.45 \sqrt[3]{D} + 0.001D$ (where 'D' represents the geometric mean). Calculate the following: a) Tolerance limits for the hole and shaft (4 marks). b) Allowance (3 marks). And find the type of fit (3 marks). For	**(10)**	**4**	**3**

other details, refer to the given tolerance tables.

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