VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD
B.E. (Mech. Engg.: CBCS) VI-Semester Main Examinations, May-2019
Metrology and Instrumentation

Time: **3** hours
Max. Marks: **70**

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Q.No.	Stem of the question	M	L	CO	PO
	Part-A (10 × 2 = 20 Marks)				
1.	Discuss the Sources of Errors in the use of Sine bar for Angular Measurement.	2	2	1	1
2.	List M45 and M87 set of Slip gauges.	2	1	1	1
3.	What is CMM? Explain Applications of CMM?	2	3	2	3
4.	Write a note on the Parkinson gear tester?	2	1	2	6
5.	What are the applications of measurement system?	2	1	3	1
6.	The pointer scale of a Thermometer has 100 uniform divisons, full scale reading is 200° C and $\frac{1}{10^{th}}$ of a scale divison can be estimated with a fair degree of accuracy. Determine the Resolution of the Instrument.	2	3	3	3
7.	A Resistance strain gauge experiences 1% change in resistance when subjected to a uniaxial strain of 5000 μ strain. Determine the Gauge Factor .What would be the sense and magnitude of error if a value of 1.9 is assumed for the gauge factor.	2	3	4	3
8.	How can you measure a force with a strain gauge load cell?	2	1	4	6
9.	Draw the sketch of Bulk modulus Pressure gauge for measuring pressure.	2	1	5	1
10.	Explain the importance of Seismic Sensing instruments.	2	1	5	1
	Part-B (5 × 10 = 50 Marks)				
11.a)	Design Workshop type Go and No Go Gauges for components having $25H_8f_9$ fit. The basic size falls in the diameter range of 18-30 mm. The fundamental deviation for f shaft = $-5.5D^{0.4}$ microns. The multipliers for 8 and 9 grades are 25 and 40. Take wear allowance as 10 % of gauge tolerance. Sketch the gauge with values.	6	5	1	3
b)	Define tolerance and its classifications? Explain briefly?	4	2	1	6
12.a)	Given the following information, determine the R_a value for the given surface and approximate RMS value. Σ areas above center line 480 mm^2 Σ areas above center line 480 mm^2 Vertical magnification = 15000 Horizontal magnification = 100 Sampling length =0.8mm	5	3	2	3
b)	Distinguish between circularity and Roundness of Engineering components and Explain why roundness is so important in Engineering manufacture.	5	3	2	1

		M	L	CO	PO
13.a)	Discuss the dynamic terms and characteristics of an Instrument.	5	1	3	1
b)	Outline the principle of Thermocouple with a neat sketch and explain clearly the Laws of Thermocouples	5	3	3	1
14.a)	List and Explain the characteristics and features of LVDT with a Neat sketch.	5	2	4	6
b)	Discuss the requirements of a strain gauge and Derive an Expression for finding the Gauge factor of a Resistance strain Gauge	5	3	4	2
15.a)	Draw a neat sketch and explain the working principle of Displacement sensing seismic accelerometer.	5	2	5	1
b)	Explain with a neat sketch the basic working principle of pressure measurement using Pirani gauge.	5	1	5	1
16.a)	Derive an expression to find out why sine bar is not preferred for generating angles larger than 45^0.	5	3	1	2
b)	Discuss the General Geometric tests performed on Lathe machine with neat sketches.	5	1	2	6
17.	Answer any *two* of the following:				
a)	Discuss the following static characteristics of an Instrument i) Hysteresis ii) Sensitivity iii) Range and Span.	5	1	3	1
b)	Draw a Neat sketch and Explain how Force can be measured with the help of a strain Gauge Load cell.	5	3	4	6
c)	Explain the importance of Data acquisition systems with suitable examples.	5	1	5	6

M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PO: Programme Outcome

S. No.	Criteria for questions	Percentage
1	Fundamental knowledge (Level-1 & 2)	55.78
2	Knowledge on application and analysis (Level-3 & 4)	37.8
3	*Critical thinking and ability to design (Level-5 & 6) (*wherever applicable)	6.31