Year and Program: SY B. Tech	School: Technology	Department: Mechanical Engg.
Course Code: MET 210	Course Title: Metrology	Semester: IV
Day and Date: Saturday 01-06-2019	End Semester Examination (ESE)	Time: Max Marks : 100 10.30am to 1.30 pm.

Instructions:

1) All questions are compulsory.
2) Assume suitable data wherever necessary.
3) Figures to the right indicate full marks.
4) Statistical table for factors in control chart and
   IS Code indicating fundamental deviation is allowed.

Q.1		Solve the following	Marks	Bloom's Level	CO
	a)	i) Describe Taylor's Principle of gauge design.	03	L_2	CO1
		ii) Design a plug gauge for inspection on shop floor for checking the hole in the following component. Consider gauge tolerance as 10% of work tolerance and wear allowance as 10% of gauge tolerance.	04	L_2	CO1

$\phi 30 ^{+0.05}_{-0.03}$
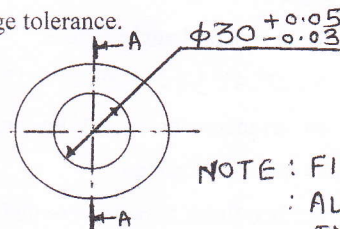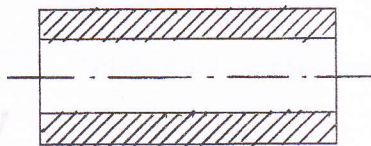
NOTE : FIGURE NTS
: ALL DIMENSIONS ARE
IN mm

OR

	a)	Discuss the characteristics of line standard and end standard. Which standard do you recommend for its use in engineering workshop? Give example of each.	07	L_2	CO1
	b)	Differentiate between comparator and measuring instrument.	08	L_2	CO2

OR

	b)	Explain with neat sketch, how will you measure the angle of taper plug gauge with help of sine bar? State limitations of sine bar.	08	L_2	CO2

Q.2		Solve the following			
	a)	Explain working of Taylor Hobson Talysurf for surface roughness measurement with sketch.	07	L_2	CO3

OR

	a)	Describe the qualitative methods for measurement of surface finish	07	L_1	CO3

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b)	Explain with neat sketch the use of gear tooth vernier caliper to measure the chordal thickness of gear tooth on the pitch circle.	08	L_2	CO4

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b)	Explain the following pitch errors with neat sketch.	08	L_2	CO4

    i) Periodic pitch error

    ii) Progressive pitch error

Q.3   **Solve any Two**

a)	i) Calculate upper limit, lower limit, tolerance for hole and shaft from the following designation. Also find the type of fit between the mating parts. $\Phi120H_7g_6$	04	L_3	CO1
	ii) Draw a neat sketch of shaft basis system to represent different types of fits. Why hole basis system is preferred over shaft basis system.	04	L_2	CO1
b)	i) What are angle gauges? State procedure to set the gauges..	04	L_2	CO2
	ii) An angle of $33^0 10' 12"$ is to be measured and to to be set with the help of following standard angle gauges.	04	L_3	CO2

$[1^0, 3^0, 9^0, 27^0, 41^0], [1',3',9',27'], [3", 6", 18", 30"]$

Show an arrangement to set up angle gauges with a sketch. Select minimum number of gauges.

c)	i) How surface finish to be represented on drawing?	02	L_2	CO3
	ii) In the measurement of surface roughness , heights and depth of of 20 points measured from datum are as follows 45, 25,35,40,25,16,40,22,25,34,25,40,20,36, 28,18,20,25,30,38 microns. If these measurements were made over a length of 20 mm, determine CLA value and RMS value of surface roughness.	06	L_3	CO3
d)	i) Explain the following errors in the gear i) Backlash ii)Runout	04	L_2	CO4
	ii) Explain the significance of backlash and the process of checking backlash.	04	L_3	CO4

Q.4   **Solve any Two**

a)	Describe in brief with neat sketch three different types of configuration for coordinate measuring machine	09	L_2	CO5
b)	Explain in brief different types of probes used in CMM?	09	L_2	CO5
c)	Explain the construction of digital instrument with Block Diagram. State, advantages and limitations.	09	L_2	CO5

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Q5　　**Solve any Two**

a)　Draw the control chart representing the following pattern. Suggest possible　　09　　L₃　　CO6
causes of the same.

    i)　Large shift from average

    ii)　Trends

    iii)　Over-control

b)　In a study on lathe used in turning a to a diameter of 25.75± 0.10 sample　　09　　L₃　　CO6
of 4 consecutive pieces was taken each day for 10 days. The diameter of
these shafts are as given below.

Construct the X bar chart and R Chart and comment on the process.

	1	2	3	4
Day 1	25.77	25.76	25.77	25.79
Day 2	25.78	25.80	25.80	25.76
Day 3	25.76	25.78	25.77	25.77
Day 4	25.78	25.79	25.73	25.73
Day 5	25.72	25.75	25.74	25.76
Day 6	25.76	25.78	25.80	25.82
Day 7	25.74	25.75	25.78	25.74
Day 8	25.76	25.80	25.77	25.79
Day 9	25.80	25.78	25.75	25.76
Day 10	25.78	25.77	25.76	25.77

c)　Table given below shows number of defectives found in inspection of aa　　09　　L₃　　CO6
lot for 100 selector fork.

Number	1	2	3	4	5	6	7	8	9	10
No of defectives	6	3	1	4	3	0	11	5	2	3

    i)　　Draw P chart and check whether process is control or not?

    ii)　　If the point that goes outside the control limits is analyzed and
eliminated what will be the value of new control limits and
revised fraction defective?

Q6　　**Solve any Three**

a)　Explain different industrial uses of machine vision.　　06　　L₂　　CO5

b)　What is meant by in-process inspection? Explain in brief with neat sketch　　06　　L₂　　CO5
any one method of in process inspection.

c)　State purpose of control charts. Also state limitations of control chart.　　06　　L₂　　CO6

d)　Compare variation due to assignable causes and variation due to chance　　06　　L₂　　CO6
causes.

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