

**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**  
**End Semester Examination, December 2021**

**Course: INTRODUCTION TO METROLOGY**  
**Program: B.Sc Int. Physics**  
**Course Code: PHYS 1028**

**Semester : I**  
**Duration : 03 hrs.**  
**Max. Marks: 100**

**Instructions:**  
**ALL QUESTION ARE COMPULSORY**  
**USE OF CALCULATOR IS PERMITTED**

<b>SECTION A</b>			
<b>(Scan and upload)</b>		<b>(5Qx 4M = 20 Marks)</b>	
		<b>Marks</b>	<b>COs</b>
Q-1	What is Metrology? State its Objective?	4	<b>CO1</b>
Q-2	If $P = (a^3b^2) \sqrt{cd}$ percentage errors in a,b,c,d are 1%,2%,3%,4%.percentage error in P.	4	<b>CO2</b>
Q-3	Resistance of a given wire is obtained by measuring the current flowing in it and the voltage difference applied across it. If the percentage errors in the measurement of the current and the voltage difference are 3% each, then find the error in the value of resistance of the wire.	4	<b>CO3</b>
Q-4	Explain sensitivity with example?	4	<b>CO4</b>
Q-5	Distinguish between Tolerance and Allowance?	4	<b>CO3</b>
<b>SECTION B</b>			
<b>(Scan and upload)</b>		<b>(4Qx10M = 40 Marks)</b>	
Q-1	What is the use of sine bar and sine Centre? Draw a suitable diagram to explain its functioning?	10 (5+5)	<b>CO3</b>
Q-2	What is the difference between static and dynamic characteristics? Explain the term threshold in detail?	10 (5+5)	<b>CO2</b>
Q-3	Define the following term a)Accuracy b)Precision c)Calibration d)Hysteresis	10 (2.5X4)	<b>CO1</b>
Q-4	What is the difference between SYSTEMATIC ERROR and RANDOM ERROR? What are the different types of systematic error applicable in measurement?	10 (5+5)	<b>CO4</b>
<b>SECTION-C</b>			
<b>(Scan and upload)</b>		<b>(2Qx 20M= 40 Marks)</b>	
Q-1	a) In an experiment, the angles are required to be measured using an instrument. 29 divisions of the main scale exactly coincide with the 30 divisions of the Vernier scale. If the smallest division of the main scale is half-a-degree ( $= 0.5^\circ$ ), then find the least count of the instrument. b) A screw gauge gives the following reading when used to measure the diameter of a wire. Main scale reading : 0 mm Circular scale reading: 52 divisions Given that 1 mm on the main scale corresponds to 100 divisions of the circular scale Find the diameter of the wire from the above data. c) A copper wire is stretched to make it 0.5% longer. What is the percentage change in its electrical resistance if its volume remains unchanged?	<b>20</b> (6+7+7)	<b>CO3</b>
Q-2	On what principle Autocollimator working depends? With the help of suitable diagram explain the working of Auto collimator? Explain how the straightness can be measured by using an autocollimator?	<b>20</b> (5+7+8)	<b>CO4</b>