Name: Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2022

Course: Introduction To Metrology   **Semester: III**
Program: M. Sc - Physics   **Time: 03 hrs.**
Course Code: PHYS 8019   **Max. Marks: 100**

Instructions: Use of calculator is permitted

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Distinguish between direct and indirect measurements. Give two examples of each.	4	CO1
Q-2	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 (= 0.5^0), Find the least count of the instrument.	4	CO1
Q-3	a) Distinguish between tolerance and allowance. b) Explain the effect of work tolerance on manufacturing cost	4	CO2
Q-4	The main scale in a vernier instrument is graduated in millimeters, with the smallest division being 1mm. Ten divisions on the vernier scale correspond to nine divisions on the main scale. Answer the following questions: (a) Is the vernier scale a forward vernier or a backward vernier? (b) What is the least count of the instrument? (c) If the main scale reads 13mm and the fifth division on the vernier scale coincides with a division on the main scale, what is the value of the dimension being measured? OR Explain the working principle of a dial caliper.	4 (1+1+2)	CO2

Q-5	Write the short notes on
	    a) Calibration
	    b) Threshold
		4
		(2+2)
			CO3

SECTION B
(4Qx10M= 40 Marks)

Q-6	Discuss the different reasons for the occurrence of systematic errors. How it is different from random error. Give example to explain it.	10	CO2
Q-7	Give the differences among the following: visual collimator, digital collimator, and laser collimator	10	CO3
Q-8	For the following hole and shaft assembly, determine (a) hole and shaft tolerance and (b) type of fit. Hole = 20 (+0.000mm, +0.025mm) and shaft = 20 (+0.005mm, +0.080mm)	10	CO3

Q-9	a) What is the working principle of a universal bevel protractor? b) What are the precautions to be taken while using it? c) The vernier scale in a bevel protractor is read in the same direction as the dial. Why?	**10** **(4+3+3)**	**CO2**
	SECTION-C **(2Qx20M=40 Marks)**		
Q-10	a) What is the basic difference between sine bars, sine plates, and sine tables? b) In a sine bar, when should the set-up be made for the complement of an angle? c) Discuss the essential requirements for maintaining accuracy in the construction of a sine bar.	**20** **(7+7+6)**	**CO2**
Q-11	a) Describe with a sketch the principle behind the working of an autocollimator. b) Discuss any two important uses of an autocollimator in the industry	**20** **(12+8)**	**CO3**