7. (a) What is photolithography? Explain the various steps involved in it. (6)

   (b) What do you mean by sputtering? Describe the process in detail. (6)



[This question paper contains 4 printed pages.]

**Your Roll No.....**

**Sr. No. of Question Paper : 4120** **H**

Unique Paper Code : 2512041202

Name of the Paper : Sensors and Actuators

Name of the Course : **B.Sc. (H) Instrumentation (CORE)**

Semester : II

Duration : 2 Hours Maximum Marks : 60

**Instructions for Candidates**

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Use of scientific calculator is allowed.
3. Attempt any **5** questions in all including **1**st Question which is compulsory.
4. **All** questions carry equal marks.

1. (a) What do you mean by the electrical transducer? (2)

   (b) Differentiate between primary and secondary transducers. (2)

(c) Give applications of photovoltaic transducers. (2)

(d) Draw diagram of DC servomotor. (2)

(e) What is an electrostatic actuator? Give one example. (2)

(f) Give applications of proximity sensors in daily life. (2)

2. (a) Name different types of Biomedical sensors. Explain the working principle of anyone. (6)

(b) Name some materials which can be used for developing sensors. (6)

3. (a) How is a differential output taken from an inductive transducer? Explain the working principle of LVDT. (8)

(b) The output of an LVDT is connected to a 6V voltmeter through an amplifier whose amplification factor is 200. An output of 2 mV appears across the terminals of LVDT when the core moves through a distance of 1.5 mm. Calculate the sensitivity of the LVDT and that of the whole set-up. The milli-voltmeter scale has 100 divisions. The scale can be read to 1/5 of a division. Calculate the resolution of the instrument in mm. (4)



4. (a) What are strain gauges? Explain piezoelectric effect with the help of suitable examples. (8)

(b) A resistance wire strain gauge uses a soft iron wire of small diameter. The gauge factor is +4.2. Neglecting the piezoresistive effects, Calculate Poisson's ratio. (4)

5. (a) Explain various types of Actuators based on the source of energy. (8)

(b) A capacitive transducer uses two quartz diaphragms of area 850 $mm^2$ separated by a distance of 3.0 mm. A pressure of 800 $kN/m^2$ when applied to the top diaphragm produces a deflection of 0.6 mm. The capacitance is 360 pF when no pressure is applied to the diaphragms. Find the value of capacitance after the application of a pressure of 900 $kN/m^2$. (4)

6. (a) What are control valves? Discuss anyone. (6)

(b) What is the principle of Chemical Vapor Deposition? Describe its working using a neat schematic diagram. (6)