Ref. No: EX/MECE 615/2024

M.TECH. VLSI DESIGN & MICRO.TECH. 3RD. SEM. EXAM.-2024

MEMS AND NEMS

TIME 3 HRS **FULL MARKS: 100**

Answer any 5 questions. Answers must be brief and to the point. Answer to one question should be at one place.

Q1. What is meant by microsystem? Explain with the help of a block diagram, the concept of smart microsystem. **20**

Q2. What is meant by miniaturization of a system? What are the benefits achieved through miniaturization? Compare between the two technologies for miniaturization. **20**

Q3. Draw the schematic diagram of a MEMS-based accelerometer sensor and explain the principle of operation. If the accelerometer be mathematically formulated as mass-spring damper system, derive a general differential equation for such model. **20**

Q4. What do you mean by acoustic wave sensors? Draw the device structure and explain the working principle. **20**

Q5. What is meant by chemi-resistor and chemi-capacitor sensor? Briefly explain how metal oxide sensors can be used as gas sensors. **20**

Q6. Explain why Si is considered as the substrate for many kinds of MEMS sensors? Explain the Czochralski method of producing single crystal Silicon. **20**

Q7. With the help of molecular structure of polymers, explain why polymers are considered as important materials for many kinds of MEMS sensors. What are the advantages of polymers as industrial materials? **20**

Q8. What is the bulk micromachining procedure for fabrication of MEMS sensors? Differentiate between isotropic and anisotropic etching. State the limitations of the anisotropic etching. **20**