

4. (a) Derive Hagen Poiseuille Equation for volumetric flow Q and pressure drop ΔP .

8

- (b) Water is to flow through a capillary tube 20 μm in diameter over length of 1000 μm . Use Hagen Poiseuille equation to determine the pressure drop in flow. 7

Unit III

5. (a) Discuss and compare impact of scaling in electrostatic and electromagnetic forces.

10

- (b) Apply Trimmer force scaling vector on power density. 5

6. (a) Explain the process and chemical reactions of deposition Silicon Dioxide their film over silicon. 8

- (b) Discuss the process and equipments of MBE. 7

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M. Tech. EXAMINATION, May 2019

(Third Semester)

(B. Scheme) (Re-appear)

(ECE)

MTEC607B

MEMS & IC INTEGRATION

Time : 3 Hours]

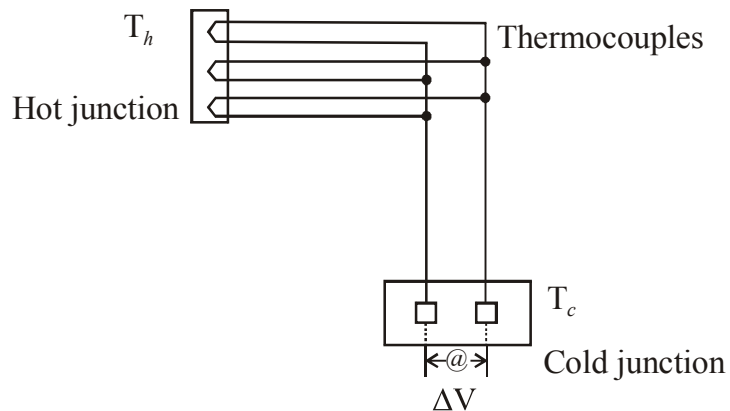
[Maximum Marks : 75

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit.

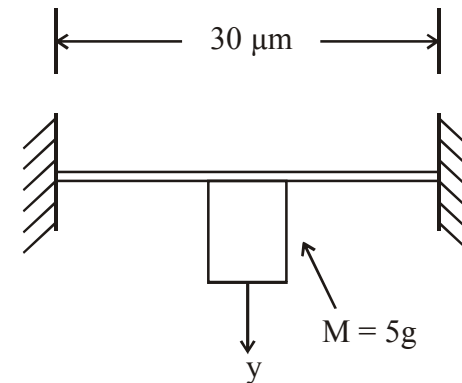
Unit I

1. (a) Compare microelectronics and microsystems. **8**
 (b) Discuss the contribution of MEMS in optical fiber communication. **7**
2. (a) Describe 3 principal signal transduction methods of micro-pressure sensor. List advantages and disadvantages of each. **10**
 (b) Estimate output voltage for microthermopile as shown in figure Cu wires are used for thermocouples with hot junction at 120°C and cold junction at 20°C . **5**



Unit II

3. (a) Discuss design of beam springs used in microaccelerometer design and derive expression for natural frequency of beam spring mass system. **10**
 (b) Find maximum amplitude of vibration for 5g Si microderivative attached to a fine strip made of Si as shown in figure : **5**



spring constant of strip = $18,240\ \text{N/m}$.
 The mass is pulled down by $5\ \mu\text{m}$ initially and is released at rest. **5**

Unit IV

7. (a) Compare Isotropic and Anisotropic Etching. 7
(b) Draw and explain major steps in DRIE. 8
8. (a) List major differences and similarities between microassembly methods and traditional assembly methods. 8
(b) Explain various considerations while selecting packaging materials for microsystems. 7

Unit IV

7. (a) Compare Isotropic and Anisotropic Etching. 7
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