## CONTENTS

1. Introduction ................................................. 1

2. Review of literature .......................................... 3
   2.1 MEMS technology........................................... 4
      2.1.1 BioMEMS.................................................. 5
      2.1.2 BioMEMS based biosensors.............................. 7
   2.2 Mass sensitive detection................................. 9
      2.2.1 Mechanical detection................................. 10
      2.2.2 Microcantilever deflection detection methods........... 11
      2.2.3 Mechanical properties of cantilever .................... 15
      2.2.4 Bending behavior of cantilever beams .................. 16
   2.3 Microcantilever sensors................................. 19
      2.3.1 Sensors based on microcantilever deflection ........... 21
      2.3.2 Sensors based on change in frequency of ............... 24
         microcantilever
      2.3.3 Environmental monitoring............................... 26
      2.3.4 Disease diagnosis....................................... 30
   2.4 Antibody immobilization................................. 34
      2.4.1 Structure of antibody.................................. 34
      2.4.2 Antibody immobilization procedures..................... 36

3. Materials and methods .................................. 41
   3.1 Materials.................................................... 41
   3.2 Methods..................................................... 43

4. Results and discussion .................................. 53
   4.1 Human IgG immobilization on gold-coated silicon .......... 54
   4.2 Antibody immobilization on bare silicon by ............... 74
      3-APTES + glutaraldehyde + protein A method
   4.3 Antibody immobilization on gold-coated silicon .......... 76
      employing biotin-neutravidin interactions
   4.4 Biomechanics of microcantilever based diagnosis.......... 80
### 4.5 Flow cell set up for microcantilever

### 4.6 Charge transfer in proteins immobilized on polylysine coated glass slide

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.5 Flow cell set up for microcantilever</td>
<td>87</td>
</tr>
<tr>
<td>4.6 Charge transfer in proteins immobilized on polylysine coated glass slide</td>
<td>88</td>
</tr>
</tbody>
</table>

### 5. Summary and conclusions

### 6. Directions for future research

### 7. Appendix

1. Concentration calibration curves
2. MATLAB based software
3. Fabrication of cantilever by S.C.L., Mohali, India
4. Simulation of microcantilever based diagnosis of hepatitis B surface antigen (HBsAg)
5. Instrumentation for nanobiotechnology

### 8. Bibliography