**AFE BABALOLA UNIVERSITY, ADO-EKITI**



**DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING**

**SECOND SEMESTER 2014/2015 EXAMINATION**

**COURSE TITLE: CURRENT TREND IN ELECTRICAL ELECTRONIC ENGINEERING (EEE 568)**

**TIME ALLOWED: TWO (2) HOURS**

**INSTRUCTION: ANSWER QUESTION 1 AND ANY OTHER 2**

**(1)** (a) Define “MEMS”, “spintronics”, and “cryogenics” and explain any two modern-day applications of each term in Engineering.

(b) With the aid of well annotated sketches, explain the fabrication steps involved in surface micromachining and state how micromachining differs from the LIGA process.

(c) (i) Calculate the resonant strain guage and the strain generated inside a 2.5mm2 cube flexure resonator with natural resonant frequency of 1Hz if the diaphragm density is 2330kg/m3 (Young’s modulus = 125GPa).

(ii) Explain the implication of your answer.

**(2)** (a) Define biosensors and describe five classes of biosensors based on measured quantities.

(b) Highlight five important factors to be considered in the design of implantable biosensors.

(c) With the aid of a relevant sketch, describe the operation of an Enzyme Field Effect Transistor (ENFET) in biosensing.

**(3)** (a) Define Surface Acoustic Waves and explain how they differ from Bulk Acoustic Waves.

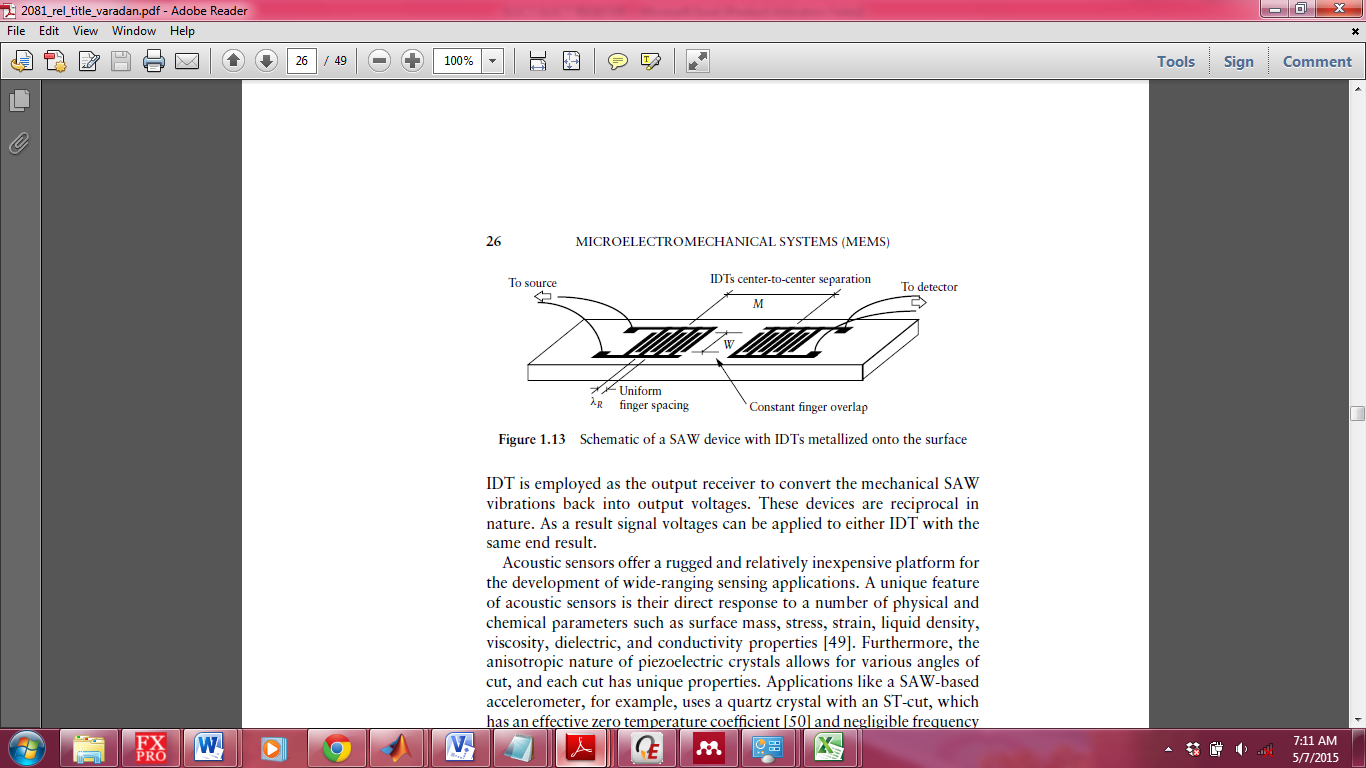
(b) Explain how the interdigital sensor in figure 3a can be adapted for real time oil pipeline leakage monitoring.

Figure 3a

(c) What are dilute magnetic semiconductors?

**(4)** (a) Define the following “superconconductors”, “Meissner effect” and “carrier-mediated ferromagnetism”.

(b) What is quenching? State five distinguishing properties of superconductors

(c) Define the term “smart grid” and explain five differences between smart grid and traditional power grid systems.

**(5)** (a) Explain the term “Functionalization of Graphene” and differentiate between stoichiometric and non-stoichiometric functionalized Graphene.

(b) Enumerate any two methods by which the conductivity of a Graphene sheet can be controlled.

(c) With the aid of appropriate sketches, describe the electronic structure of Graphene.