# COLLEGE OF ENGINEERING & TECHNOLOGY

**Department** : **Electrical & Control Engineering**
**Lecturer** : **Dr. Ahmed Kadry Abdelsalam**
**Course** : **Electrical measurements and instrumentation 2**

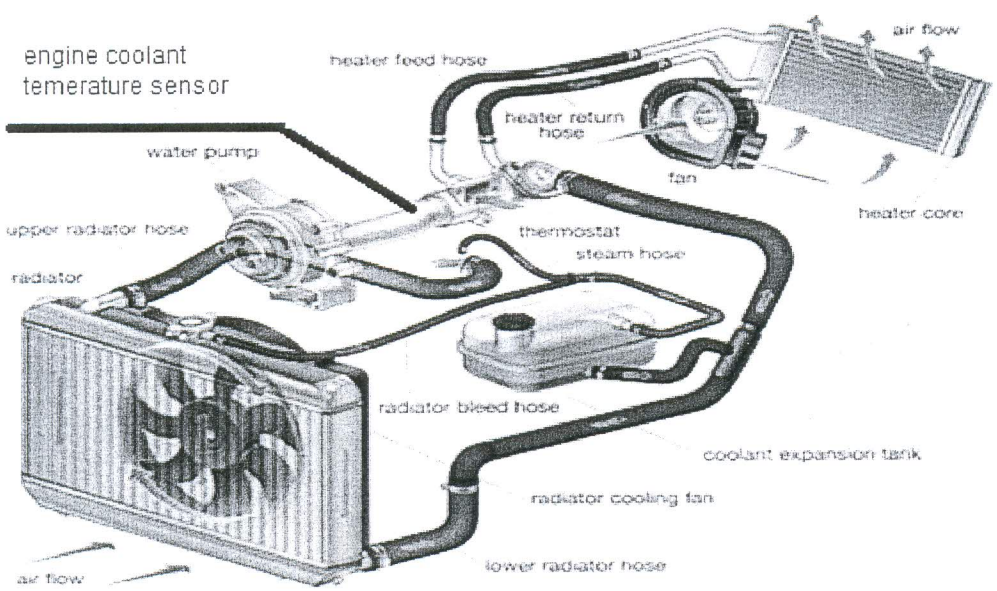
**Course Code** : **EE 312** **Marks** : **40**
**Date** : **18/1/2015** **Time** : **2 hour**

## *Final Exam*

**Answer all the following questions**

**Q1- 15 marks** A.5, A.26, B.15

In a car engine management unit, an engine coolant temperature sensor has an output/input relation as 0.01v/0C.
For a full range of $100^0$C, design a signal conditioning circuit that adjusts the sensor output to be from -5v to 5v for the full measured range. Also, design a circuit that triggers an alarm when the temperature is between $90^0$C and $95^0$C. The design MUST include all the required passive elements and power supply values.




**Q2- 5 marks** A.25

Discuss aided with drawings and equations the instrumentation amplifier theory of operation. Start from the basics, proof the final formula for this amplifier's input-output relation.

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| Course Coordinator : | Dr Ahmed Elshenawy | | |
| Head of Department: | Porf. Hamdy Ashour | Hamdy | 5/1/2015 |

**Q3-10 marks** B.15

Compare, aided with drawings and discussion, between the Dual Slope and Successive Approximation (A/D) converters from theory of operation, construction, advantages and disadvantages points of view.

**Q4- 5 marks** C.14

Illustrate with diagram the Total radiation pyrometer principle of operation stating its advantages and disadvantages.

**Q5- 5 marks** A.25 , C.15

Compare between RTD and thermistors from the following points of view:

- Construction (show with diagrams)
- Theory of operation (show with curves and equations)
- Cost
- Transducer need
- Range

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