

## FACULTY OF ENGINEERING

B.E. 4/4 (E & EE) I – Semester (Main) Examination, December 2011

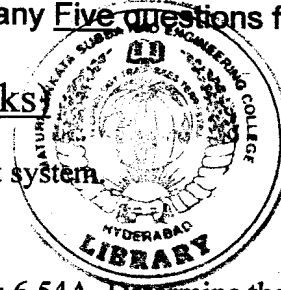
Subject: **Transducers (Elective – I)**

Time: 3 Hours

Max. Marks: 75

**Note:** Answer all questions from Part A. Answer any Five questions from Part B.

### Part- A (25 Marks)



1. Draw the block diagram of a generalized measurement system. 2M
2. Define: a) Span b) Range. 2M
3. An ammeter reads 6.7A and the true value of current is 6.54A. Determine the error and correction factor for this instrument. 3M
4. What are the dynamic characteristics of measurement system? 3M
5. What are basic requirements of transducers? 3M
6. Define "Gauge factor". 2M
7. Why the two secondary coils of LVDT are connected in series opposition? 2M
8. Define the laws of 'Thermocouples'. 3M
9. Explain the principle of 'Piezo-electric transducers'. 3M
10. Write the applications of 'Hall effect sensors' 2M

### Part-B(50 Marks)

11. a) Define the following static characteristics of instruments with necessary examples and graphs: (i) Accuracy (ii) Sensitivity (iii) Static error (iv) Dead space (v) Drift. 5M  
 b) A voltage has a true value of 1.5V. An analog indicating meter with a scale range of 0-2.50V shows a voltage of 1.46V. What are the values of absolute error and correction factor? Express the error as a fraction of the true value and full scale deflection. 5M
12. Explain why it is necessary to carry out frequency domain analysis of measurement systems? What are the two plots obtained when the frequency response of a system is carried out? Explain with examples. 10M
13. a) What is a strain gauge? Discuss the principle of operation of different types of strain gauges. 7M  
 b) A resistance strain gauge with a gauge factor 2 is fastened to a member, which is subjected to a strain of  $1 \times 10^{-6}$ . If the original resistance value of the gauge is 130, calculate the change in resistance. 3M
14. a) Explain the construction and working principle of potentiometers. 7M  
 b) What are the applications of potentiometers. 3M
15. a) Describe the construction, theory and working of 'Thermocouples'. 6M  
 b) Write short notes on different types of 'Thermocouples'. 4M

16. a) Show how output voltage signals proportional to linear displacements imparted to the movable plate of a parallel plate capacitor. 7M

b) Discuss the problems encountered while measuring small displacements by capacitive transducers. 3M

17. Explain the principles of following transducers:

a) Eddy current sensors.

b) Fiber-optic sensors.

c) Semiconductor sensors.

d) Electro-optic sensors.

10M