

**B. MECHANICAL ENGINEERING (PART TIME) - THIRD YEAR - SECOND SEMESTER  
EXAMINATION 2017**

**EXPERIMENTAL METHOD IN FLUID DYNAMICS**

Time : 3 hours

Full Marks: 100

Answer any five [5] questions  
All questions carry equal marks

1. Explain the generalized input-output configuration of measurement systems and the different methods of correction of spurious inputs with suitable examples. 20

2. Explain the basic functional elements of measurements system with two suitable examples. 20

3. The length of a certain size of copper wire is given by

$$L=L_0[1+ \alpha(T - 20)]$$

where  $L_0$  is the length at 20°C, and have been measured for 10 times [in mm] as 10.18, 10.14, 10.25, 10.11, 10.10, 10.18, 10.11, 10.18, 10.20, 10.19.

The co efficient of linear thermal expansion of copper have been measured for 6 times (in per°C) as  $16.6 \times 10^{-6}$ ,  $16.7 \times 10^{-6}$ ,  $16.7 \times 10^{-6}$ ,  $16.6 \times 10^{-6}$ ,  $16.5 \times 10^{-6}$  and  $16.6 \times 10^{-6}$ .

The Temperature  $T$  is measured for 10 times [in °C] as 30.10, 30.11, 29.85, 29.99, 30.01, 30.05, 29.98, 30.05, 30.11, 30.11.

For a 95% reliability, calculate the uncertainty in measurement of the length of the wire  $L$ . 20

4. What are the relative advantages and disadvantages of null and deflection methods of measurement? Distinguish between analog and digital modes of operation. Explain static calibration and mention the basic steps of the same. 6+6+7

5. a. What do you mean by resolution? How is it different from Threshold?

b. The power transmitted by a rotating shaft can be given by,  $W=2\pi RFL/t$

Where,

$R=1,205 \pm 2$  [rev] is the revolution of shaft during time  $t$ ,  $F=45 \pm 5\%$  [N] is the force at end of torque arm,

$L=0.397 \pm 2\%$  [m] is the length of torque arm,  $t=60 \pm 5$  [sec] is the time length of run

For a 95% reliability, calculate the uncertainty in measurement of  $W$ . 5+15

6. Write short notes on the following: 4 x 5

a. Sensitivity and Linearity b. Accuracy and Precision c. Active and Passive Transducers

d. Hysteresis and dead-space