# M.E. MECHANICAL ENGINEERING
## FIRST YEAR FIRST SEMESTER EXAM 2018

### EXPERIMENTAL METHODS IN MECHANICAL SYSTEMS

Time : 3 hours                                          Full Marks: 100

### Answer any 4 (four) questions

1a. Distinguish between modifying input and interfering input.
b. What do you mean by static calibration? State the basic steps of the same.
c. With the help of two suitable examples explain the method of correction of spurious inputs of a measurement system using opposing inputs.                     6+7+12

2. Cite a suitable example of a first order instrument and find the input-output relationship for the same. With suitable plots explain its step response and frequency response.                     12+6+7

3a. State a suitable example of output filtering and explain how it can be useful in correcting spurious input effects of the instruments.
b. The discharge, $Q$ from a V-Notch is characterized by the following equation
$Q = 8/15 \ (2g)^{1/2} \tan(\theta/2) \ H^{5/2}$
Where,
the gravitational acceleration $g$ is measured 5 times [in m/s$^2$] as: 9.80, 9.78, 9.79, 9.78, 9.80,
the notch angle $\theta$ has been measured 10 times [in degree] as: 44.59, 44.79, 45.02, 45.01, 44.99, 44.99, 45.11, 45.09, 45.00, 44.88,
the head over the crest, $H$ has been measured 8 times [in mm] as: 23.2, 23.8, 23.9, 22.8, 23.0, 23.1, 23.2, 23.3.
Find out the uncertainty in measurement of $Q$.                     7+18

4a. State the basic difference between variable conversion element and variable manipulation element.
b. State the relative advantages and disadvantages between the following:
i.  Null and deflection method
ii. Analog and digital mode of operation
c. What do you mean by flow variable and effort variable? State suitable example to explain how the loading effect can be characterized using the same. Define generalized input impedance and generalized input admittance.                     3+(5+5)+(3+6+3)

5. Write short notes on:
a. Static sensitivity and linearity, b. Hysteresis and dead space, c. Active and passive transducers, d. Accuracy and precision, e. Threshold and resolution                     5x5