



- KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

Answer ALL Questions

(10 X 10 = 100 Marks)

1. ✓ Few of the characteristics of generic sensor system are rather very much identical. Justify that these are unique by defining and providing a brief note on each of the following:
 - i) True Value and Measured Value
 - ii) Accuracy and Precision
 - iii) Dead Time and Dead Zone
 - iv) Span and Range
2. ✓ An accelerometer, connected to an automobile, is working based on a differential capacitive sensing mechanism where two capacitors are connected in parallel with one common central plate connected to a tether. The length and width of the plates are $10\ \mu\text{m}$ and $5\ \mu\text{m}$. The plates are kept $4\ \mu\text{m}$ apart in each case. The tether moves in such a way that it shifts the central plate by $4\ \mu\text{m}$ for $3\ \text{g}$ acceleration. Calculate the voltage, capacitance and difference in the voltage across the capacitor plates when the vehicle experiences $3\ \text{g}$ acceleration. (Take $\epsilon_0 = 8.85 \times 10^{-12}\ \text{F/m}$; excitation voltage as $2\ \text{V}$).
3. ✓
 - (a) Explain with a neat schematic diagram, how temperature compensation circuits work for a Wheatstone bridge configuration? [5]
 - (b) The impedance of the basic AC bridge as shown in figure 1 below are given [5]
 $Z_1 = 210\ \Omega$, $\theta_1 = 70^\circ$; $Z_2 = 400\ \Omega$, $\theta_2 = -60^\circ$, $Z_3 = 300\ \Omega$, $\theta_3 = 0^\circ$ and $Z_4 = 600\ \Omega$, $\theta_4 = 30^\circ$. Determine whether it is possible to balance the bridge under this condition.