[Time: Three Hours]   [Marks:80]

N.B: 1.   Question.No.1 is compulsory.
         2.   Attempt any three questions from remaining five questions.
         3.   Assume suitable data wherever necessary.

1   Attempt any four .   20
    a   Explain electrodes used for PH measurement.
    b   State the working principle of elastic type pressure sensors also draws its neat sketches.
    c   Compare orifice and venturi meter.
    d   Explain various energy losses in pipes.
    e   Derive the expression for gauge factor of strain gauge.

2   a   Draw and explain pressure measurement scheme using bourdon tube and LVDT.   10
    b   State and derive Bernoullis equation.   10

3   a   Explain in details sutaible instrument used for calibration of pressure gauges.   10
    b   What is ORP ? Explain setup used for ORP measurement.   10

4   a   A strain gauge bonded to a steel beam 0.1 m long and has a crossectional area 4 cm^2.Young's modulus for steel   10
        is 207 GN/m^2.The strain gauge has an unstrained resistance of 240Ω and gauge factor of 2.2.When a load is
        applied,the resistance of gauges changes by 0.013Ω.Calculate the change in length of the steel beam and an
        amount of force applied to the beam.
    b   Explain with diagram working of Mcleod Gauge   10

5   a   Classify flow measurement techniques .Explain the construction and working of electromagnetic flow meter.   10
    b   Explain the need of temperature compensation for strain gauge and state applications of strain gauge.   10

6   Write a short note on :-   20
    a   Viscosity measurement
    b   Dynamometer
    c   Torque measurement