PURWANCHAL UNIVERSITY
V SEMESTER FINAL EXAMINATION- 2006

LEVEL : B. E. (Computer)
SUBJECT: BEG330EC,Instrumentation-I
Full Marks: 80
TIME: 03:00 hrs **Pass marks:** 32

Candidates are required to give their answers in their own words as far as practicable.
All questions carry equal marks. The marks allotted for each sub-question is specified along its side.
Attempt ALL questions.

Q. [1] [a] Explain the main elements of general instrumentation system with neat sketch. [5]
[b] A voltmeter is specified to be accurate to 1.5% of its full scale reading. If the 100v scale is used to measure voltages of a) 85v b) 15v , how accurate will the readings be due to meter error only and write down the significance. [6]
[c] Explain the static & dynamics characteristics in measurement system. [5]

Q. [2] [a] What are the problems encountered with Maxwell's bridge for the measurements of high-Q coils? Explain. [5]
[b] Explain the loading effect while using POT for the measurement of displacements? [6]
[c] Define electric transducer? Write down the general classification of transducers & explain any one. [5]

Q. [3] [a] Describe with neat sketch the working of LVDT for the measurement of displacement. [7]
[b] Explain with circuit diagram how digital to analog conversion is done using R-2R ladder network. [6]
[c] Explain how two or more signals can be added by using OP-Amp. [3]

Q. [4] [a] What do you mean by signal conditioning and why is its significance in instrumentation? Describe the dc signal conditioning with block diagram. [6]
[b] Derive an expression for the output voltage of differential capacitor arrangement for the measurement of displacement. [7]
[c] A piezoelectric crystal having dimensions 5mm×6mm×2mm has a sensitivity of 0.056 V-m/N. Calculate the applied force to be measured if the measurement voltage at the output is 120v. [3]

Q. [5] [a] What are the general methods of data transmission? Describe analog current telemetry system. [8]
[b] What are the functions of output devices in instrumentation system? Describe how strip chart recorder is used to record the variation of input signal. [8]
[c] Write short notes on any four of the followings: [4×4]
[a] Loading effect due to ammeter.
[b] Magnetic taper recorder.
[c] Shielding and grounding.
[d] Thermocouple instrument.
[e] Accuracy and precision.
[f] Night vision imaging system.

PURWANCHAL UNIVERSITY
2009
B. E. (Computer)/Fifth Semester/Final
Time 03:00 hrs. Full Marks: 80/Pass Marks: 32

BEG330EC: Instrumentation-I

Candidates are required to give their answers in their own words as far as practicable.
Figure in the margin indicates full marks. .
Answer FIVE questions.

Q. [1] **[a]** What are the components of an instrumentation system? Draw the block diagram and describe in brief. [6]
[b] An ac bridge has the following constants: Arm Z_1:R = 450Ω , Z_2:R = 300Ω in series with C = 0.265 μF, Z_4 unknown Z_3:R = 200Ω in series with L = 15.9 mH. The oscillator frequency is 1khz. Find the constant of arm Z_4. [5]
[c] The current passing through the register of $200 \pm 0.8\ \Omega$ is 3.0 ± 0.02A. Calculate the limiting error in the compiled value of power dissipation [5]

Q. [2] **[a]** Explain how can the response of a capacitive transducer which works on the principle of variation of capacitance with displacement between two plates be made linear. Also give the sensitivity of such an arrangement. [6]
[b] Design the circuit so that the output voltage of the system is $V_{out} = \frac{d}{dt}\left[\frac{5V_1 + 2V_2}{3}\right]$, Where V_1 and V_2 are input voltages. [5]
[c] Explain how instrumentation amplifier is useful in recovering small signals buried in large common mode offsets. [5]

Q. [3] **[a]** Explain the voltage and current telemetry system. [4]
[b] List some of the applications that make the op-amp such a versatile building block in the design of measurement instrumentation Explain any three such applications. [2+6]
[c] Find the successive approximation A/D output for a 4 bit converter to a 3.127v input if the reference is 5v. [4]

Q. [4] **[a]** Describe how digital to analog conversion is achieved using R-2R ladder network. [6]
[b] Define ground loop. Explain how ground loops may exist in system even if only one point grounding is done. [5]
[c] Explain why synchronous data transmission can be faster than asynchronous data transmission. [5]

Q. [5] **[a]** Explain how optical fivers are used in signal transmission. Give its advantages over conventional transmission media. **[8]**
[b] Describe the suitable output device that can be used for the measurement of speed-torque characteristics of motors. [8]

Q. [6] **Write short notes on any FOUR** **[4×4=16]**
[a] Transducer.
[b] Application of instrumentation.
[c] Op-amp
[d] Analog and digital transmission.
[e] Interference of signals.
[f] Wheatstone bridge.