

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Instrumentation (New)

Semester: Fall

Year : 2024
Full Marks : 100
Pass Marks : 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define Instrumentation System? Explain Static Performance Parameters of instruments. 8
- b) An ac bridge with terminals ABCD has in arm AB, a pure resistance; arm BC, a resistance of $800\ \Omega$ in parallel with a capacitor of $0.5\ \mu\text{F}$; arm CD, a resistance of $400\ \Omega$ in series with a capacitor of $1.0\ \mu\text{F}$; and arm DA, a resistance of $1000\ \Omega$. 7
 - i. Obtain the value of frequency for which the bridge can be balanced.
 - ii. Calculate the value of resistance in arm AB to produce balance.

OR

An AC bridge circuit is working at $1000\ \text{Hz}$. Arm AB has $0.2\ \mu\text{F}$ pure capacitance, arm BC has $500\ \Omega$ pure resistance, arm CD contains an unknown impedance, and arm DA has $300\ \Omega$ resistance in parallel with $0.1\ \mu\text{F}$ capacitor. Find the constants of arm CD considering it as a series circuit.

2. a) Show that Gauge factor $G = 1 + 2\mu$; where symbols have their usual meanings. 8
- b) Illustrate working principle of Dynamometer Type Wattmeter with necessary expression and diagram. 7
3. a) What is data acquisition system? Explain the digital data acquisition system with necessary block diagrams. 7
- b) Describe an Op-amp? Derive the expression for gain of Instrumentation Amplifier. 8

OR

Design an summing circuit using op-amp to get output expression given by $V_0 = 2V_1 - 3V_2 - 5V_3$.

4. a) What will be the SA digital output for an analog input of 3.3V if $E_R=5V$? 8
 b) Explain the R-2R ladder network DAC with necessary diagrams and derivations. 7
5. a) Define wave analyzer. Explain the heterodyne wave analyzer in detail with necessary block diagram. 8
 b) What is meant by counter error? Explain the Integrating type digital voltmeter with the necessary block diagram. 7
6. a) What is an oscilloscope? Draw and explain the different parts of CRT. 8
 b) A D' Arsonval meter movement with an internal resistance $R_m = 100 \Omega$ and full scale current of $I_m = 1mA$ is to be converted into a multi range dc voltmeter with range of 0-10 V, 0-50 V, 0-250 V, 0-500 V. Find the values of various resistances using the potential divider arrangement. 7
7. Write short notes on: (Any two) 2×5
 - a) Resistance Thermometer
 - b) Op-amp as an adder
 - c) Instrument Transformer