POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Instrumentation

Semester : Spring

Year : 2023
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

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) What are the components of an instrumentation system? Explain each component in brief along with the suitable diagram. 7

   b) Bridge circuits are used for the measurement of unknown parameters' Explain? Derive the necessary expression to measure the value of unknown inductance using bridge circuit. 8

2. a) A bridge has the following components: arm AB, R = 900 Ω in parallel with C = 500 μF; BC, R = 1000 Ω in parallel with C = 200 μF; CD, L = 0.5 H in series with R = 500 Ω. Find the constants of arm DA to balance the bridge. Also determine the parameters (R, L or C) of unknown arm DA connected in the bridge arm . Assume frequency f = 1 KHz. 7

   b) Induction type Energy meter and electrodynmo type wattmeter are very important instruments in this digital era Explain both with its block diagram and working principle. 8

3. a) How can the range of an ammeter be extended? Design an Aryton Shunt to provide an ammeter with current ranges 1 A, 5 A and 10 A. The configuration consists of a d'Arsonval movement with an internal resistance R_m=50Ω and full scale deflection current of 1 mA. 8

   OR

   Why Electronic multimeter is more applicable than normal meter? Explain in brief about electronic multimeter.

   b) Explain the single channel and multichannel Data Acquisition System (DAS) with their block diagrams. 7

4. a) Define Instrumentation amplifier. Explain the working principle of an instrumentation amplifier. 8

OR

Sketch the circuit of summing amplifier using Op-Amp to get $Vo=V_1-2V_1-3V_3$.

b) What will be the successive approximation digital output for an analog input of 3.12 V from a 4-bit converter given that Vref=8V? Also draw the circuit. 7

5. a) Draw and explain R-2R ladder network Digital to Analog Converters. List it's advantages over binary weighted Resistance Network DAC. 7

b) Define wave analyser and contrast it with spectrum analyser. Draw and explain the heterodyne wave analyser in detail. 8

6. a) Discuss about the different types of counter errors in the digital instrumentation. 7

b) Define oscilloscope and list its uses. Draw and explain the Digital storage oscilloscope in detail. 8

7. Write short notes on: **(Any two)** 2×5

a) Transducer and Inverse Transducer

b) Probes and Connectors

c) Potentiometer type recorder