R18

Code No: 154BC

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year II Semester Examinations, September/October - 2023
INSTRUMENTATION AND CONTROL SYSTEMS
(Mechanical Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART - A

(25 Marks)

1.a)	Define measurement and explain its significance in our day to day life.	[2]
b)	Explain the following terms. i) Accuracy ii) Precision iii) Threshold.	[3]
c)	Differentiate gauge pressure and vacuum pressure.	[2]
d)	Explain the principle on which the bimetallic thermometer works.	[3]
e)	Discuss about Vena contracta point.	[2]
f)	What are the advantages of level measurement using displacer and torque tube?	[3]
g)	How a strain gauge is used for measuring torque?	[2]
h)	Define relative humidity, absolute humidity and dew point.	[3]
i)	What are the basic elements of a control system?	[2]
j)	Differentiate a feedback and non-feedback control system.	[3]

PART - B

(50 Marks)

2.a) Explain how displacement can be measured with the help of an inductive and capacitive transducer.
b) What are the sources of error? Explain the methods of elimination error. [5+5]

OR

3.a) A resistor has a nominal value of 10 Ω ± 1%. A voltage is applied across the resistor and calculates the power consumed in the resistor. Calculate the uncertainty in each case when the measured values of E and I are: E = 100 V ± 1% and I = 10 A ± 1%.
b) Sketch and explain with a block diagram generalized measurement system and its elements with an example. [5+5]

4.a) Platinum RTD has resistance at 0^0 C is 100Ω. If the temperature co-efficient of Platinum is 3 3.91×10^{-3} / ^{0}C, then find its resistance at 100^0 C.
b) Explain the construction and working of McLeod pressure gauge used for low pressure measurement. [5+5]

OR

5.a) By utilizing the principle of radiation pyrometer explain how temperature is measured with help of a relevant diagram.
b) Explain the operation of pirani thermal conductivity gauge for pressure measurement with sketch. [5+5]

6.a) A Stroboscope projects 6000 flashes per minute on a disk mounted on the shaft of a machine. Find the speed of the machine if the disk appears stationary and has a single image of 10 points.

b) Explain the working principle of non-contact type of electrical transducers. [5+5]

OR

7.a) Explain the working principle of operation of turbine flow meter with neat sketch.

b) A piezoelectric accelerometer has a transfer function of 61 mV/g and a natural frequency of 4500 Hz. In a vibration test at 110 Hz, a reading of 3.6 V peak is obtained. Find the vibration peak of displacement. [5+5]

8.a) Discuss in detail the working of any one type of dynamometers used for force measurement.

b) Explain the working of psling psychomotor with neat sketch and also list out its limitations in usage. [5+5]

OR

9.a) Briefly discuss about torque measuring methods using strain sensors.

b) What is a proving ring? How is it used to measure force? [5+5]

10.a) Explain the applications of control systems with respect to governing of speed.

b) What is a block diagram? Explain the steps involved in the preparation of block diagrams. [5+5]

OR

11.a) Describe a typical closed loop control system that can be used to control the temperature of water being heated by steam.

b) How feedback control system is applied for temperature control of air conditioned system? [5+5]

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