Code No: R1632032 **R16** SET - 1

III B. Tech II Semester Supplementary Examinations, November – 2019

INSTRUMENTATION AND CONTROL SYSTEMS

(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A (14 Marks)

1. a) Define static error. Distinguish reproducibility and repeatability. [2M]
   b) Explain about ionization pressure gauges. [2M]
   c) Distinguish between cryogenic fuel level indicators and bubbler level indicators. [2M]
   d) Define gauge factor. [3M]
   e) What are torsion meters? [3M]
   f) Compare open loop system and closed loop system. [2M]

PART –B (56 Marks)

2. a) Explain the static and dynamic characteristics of measurement systems. [7M]
   b) With neat sketch explain photo electric transducers. [7M]

3. a) Explain the operation of Bimetallic and quartz crystal thermometers. [7M]
   b) A Thermistor has a temperature coefficient of resistance of -0.04 over a temperature range of 20^0 C to 40^0 C. Find the resistance of the thermistor at 35^0 C, if the resistance of the thermistor at 300 C is 200 Ω. [7M]

4. a) Discuss about hot – wire anemometer. [7M]
   b) Explain the principles of seismic instruments. Using this principle explain the operation of vibrometer. [7M]

5. a) Derive an expression for gauge factor of a strain gauge. [7M]
   b) Explain method of usage of resistance strain gauge for bending compressive and tensile strains. [7M]

6. a) Explain with necessary diagrams the working principle of an absorption psychrometer. [7M]
   b) Discuss about Elastic force meters. [7M]

7. a) With an example, explain the open loop control system. [7M]
   b) Derive the transfer function for D.C servomotor. Explain about torque-speed characteristics. [7M]

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Code No: R1632032 **R16** SET - 1

III B. Tech II Semester Regular/Supplementary Examinations, October/November - 2020

INSTRUMENTATION AND CONTROL SYSTEMS

(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A (14 Marks)

1. a) List the different sources of errors. [2M]
   b) Write the advantages of thermocouples. [2M]
   c) Write the demerits of a capacitive level indicator. [2M]
   d) Discuss the salient features and applications of electrical strain gauges. [3M]
   e) How does a psychrometer work? [3M]
   f) Write the classification of control systems. [2M]

PART –B (56Marks)

2. a) Discuss the theory and construction of piezoelectric transducers. [7M]
   b) Explain the working of a capacitive transducer for the measurement of displacement. [7M]

3. a) What is a thermistor? Explain the construction and working of a thermistor with a neat sketch. [9M]
   b) Explain the working of the Mcleod pressure gauge. [5M]

4. a) Describe with neat sketches, the construction and working principle of a rotameter. [9M]
   b) Explain the working of the laser Doppler anemometer. [5M]

5. a) Explain about the electrical strain gauge. [7M]
   b) A single electrical resistance strain gauge of resistance 120 Ω and having a gauge factor of 2 is bonded to steel having an elastic limit stress of 400 MN/m^2 and modulus of elasticity 200 GN/m^2. Calculate the change in resistance (i) due to a change in stress equal to 1/10 of the elastic range (ii) due to a change of temperature of 20^0, if the material is advanced alloy. The resistance temperature co-efficient of an advance alloy is $20\times10^{-6}/^0$C. [7M]

6 Write a short note on the following with a neat sketch: [14M]
a) Sling psychrometer b) Load cell.

7. a) Explain in brief the elements of control systems. [7M]
   b) With suitable examples, bring out the advantages of closed-loop systems over open-loop systems. [7M]

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Code No: R1632032 **R16** SET - 1

III B. Tech II Semester Supplementary Examinations, April - 2021

INSTRUMENTATION AND CONTROL SYSTEMS

(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A (14 Marks)

1. a) What are instrumental and environmental errors? How can they be avoided? [2M]
   b) Enumerate the advantages of thermistor. [2M]
   c) Write the advantages of a capacitive level indicator. [3M]
   d) What is meant by gauge factor? [2M]
   e) What are the applications of load cell? [3M]
   f) What is closed loop system? [2M]

PART –B (56 Marks)

2. a) Write the static characteristics of an instrument. [7M]
   b) Explain the functional description of measuring instruments. [7M]

3. a) What is pyrometer? Name two types of pyrometers used in industry. [4M]
   b) What are the different types of manometers? Explain the working of any one of them with neat sketch. What are the different types of errors in manometers? [10M]

4. a) Explain the construction and working of turbine flow meter. [7M]
   b) Differentiate between mechanical and electrical tachometers. [7M]

5. a) Drive an equation for gauge factor for a metallic strain gauge. [7M]
   b) A strain gauge having a resistance 100 Ω and gauge factor of 2 is connected in series with a ballast resistance of 100 Ω across a 12 V supply. Calculate the difference between the output voltage with no stress applied and a stress of 140 MN/m^2. The modulus of elasticity is 200 GN/m^2. [7M]

6. a) What is the importance of humidity control in process industries? [7M]
   b) Explain, with a neat sketch, the construction and working of dynamometer for measurement of power. [7M]

7. a) What are the various elements of control system? Explain in brief. [7M]
   b) Distinguish between open-loop and closed loop control systems with the help of a suitable diagram. [7M]

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Code No: **R1632032** **R16** SET - 1

III B. Tech II Semester Regular/Supplementary Examinations, August-2021

INSTRUMENTATION AND CONTROL SYSTEMS

(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A **(14 Marks)**

1. a) What are the various types of transducers to measure linear displacement? [2M]
   b) List out the disadvantages of thermistors. [2M]
   c) Write the advantages of rotameter. [2M]
   d) Write the comparison between compressive strain and tensile strain. [3M]
   e) How do you measure the moisture content of gases? [3M]
   f) What are the elements of a control system? [2M]

PART –B **(56 Marks)**

2. a) Write the dynamic characteristics of an instrument. [7M]
   b) Explain briefly the types of errors involved in measurement systems. Discuss the means adopted to reduce these errors. [7M]

3. a) Explain the working of radiation pyrometer and write the sources of errors. [7M]
   b) Draw a neat sketch to show the essential parts of a Bourdon tube pressure gauge. Describe the purpose of each part. [7M]

4. a) Explain with a neat sketch the working of vibrometer. [7M]
   b) Discuss the construction and working of hot wire anemometer. [7M]

5. a) Explain the principle of working of electrical strain gauge. [7M]
   b) What are various types of stress and strain measurement? Explain in brief. [7M]

6 Write short note on the following with neat sketches: [14M]
i) Absorption psychrometer; ii) Dew point meter.

7. a) Write advantages and disadvantages of open loop and closed loop control systems. [7M]
   b) Explain with the help of a block diagram the working of the position control systems. State its applications. [7M]

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