BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – M.Tech.(RA)-2024
Course Name – Mechatronics System Design
Course Code - MEC20304A
(Semester II)

Full Marks : 60   **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)   1 x 15=15

1.   *Choose the correct alternative from the following :*

(i)   Define, which of the following is correct for tactile sensors.

   a) Touch sensitive   b) Pressure sensitive
   c) Input voltage sensitive   d) Humidity sensitive

(ii)   Define, which of the following can be cause for non-zero output when zero input.

   a) Bias   b) Slew
   c) Offset   d) Offset or bias

(iii)   Define, which of the following error is caused by a reversal of measured property.

   a) Hysterisis   b) Noise
   c) Digitization error   d) Quantization error

(iv)   Indicate, Which sensor should be used for calculating temperature as well as humidity.

   a) DHT11   b) LM335Z/NOPB
   c) HC-SR04   d) MPX10DP

(v)   Illustrate, which sensor is used in line following robots.

   a) Infrared Sensor   b) Microwave Radar Sensor
   c) Ultrasonic Sensor   d) Temperature Sensor

(vi)   Illustrate, which is not a solid state device.

   a) Mother board   b) Integrated circuit
   c) Hard disc   d) Flash memory

(vii)   Select, which among the following is a false statement regarding "Mechatronic system".

   a) Its initial cost of setup is high   b) Requires highly skilled labours for operating it

c) More output in less time

d) Easy to identify faults and repair it

(viii) Explain, what converts physical input into output, among the basic parts of a measuring system.

a) Transducer or sensor

b) Signal conditioning

c) Intelligence

d) Display

(ix) Judge whether feedback control systems are referred to as closed loop systems.

a) 1

b) False

c) undefined

d) None of the mentioned

(x) Identify, in a temperature control system, what conversion in signal takes place.

a) Digital to Analog

b) Analog to Digital

c) Error to Digital

d) Error to Analog

(xi) Choose the correct answer:Transient response analysis is done for_____ systems.

a) Unstable

b) Stable

c) Conditionally stable

d) Marginally stable

(xii) Select the name of the first country to give citizenship to any humanoid robot.

a) Saudi Arabia

b) USA

c) India

d) Africa

(xiii) Indicate, the main mechanical components of a servo motor are stator and rotor.

a) Servo motors have stators and rotors

b) Servo motors do not have stators and rotors

c) Not defined

d) None of the mentioned

(xiv) Describe whether a Mechatronics system contains feedback.

a) It has feedback

b) It does not have feedback

c) Not defined

d) None of the mentioned

(xv) Illustrate whether, primitive methods should be preferred over mechatronic systems for short term manufacturing.

a) Mechatronics systems are preferred

b) Mechatronics systems are preferred

c) Not defined

d) None of the mentioned

Group-B
(Short Answer Type Questions)

3 x 5=15

2. Define Mechatronics. (3)
3. Illustrate the definition of transducer. (3)
4. Explain about straingauge. (3)

5. Express the working principle of hydraulic system. (3)

6. Illustrate the various elements of a closed loop system for a person controlling the temperature. (3)

OR

Compare open loop and closed loop control system. (3)

Group-C
(Long Answer Type Questions)

5 x 6=30

7. Explain, the Challenges and Future Trends in Mechatronics and Automation. (5)
8. Illustrate about modeling of mechanical system and what are the parameters of translational (5) motion.

9. Explain, how can we determine the transfer function and frequency response of a system. (5)

10. Explain Transfer Function of an Operational Amplifier. (5)

11. Develop a case study on Automatic Rain Sensing in Vehicle Windshield Wipers. (5)

12. Report the key components of a Mechatronics system and how do they work together to (5) achieve a desired outcome.

OR

Write some of the challenges faced in implementing a Mechatronics system in a (5) manufacturing setting and how can they be addressed.

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