BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – B.Tech.(RA)-2021
Course Name – Mechatronics
Course Code - OEC-ECR702A
(Semester VII)

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) Recall, thermocouple generate output voltage according to _____
a) Circuit parameters b) Humidity
c) Temperature d) Voltage

(v) Tell, which factor affects the least while selection of sensor.
a) Size b) Accuracy
c) Colour d) Durability

(vi) Tell, which IC (integrated circuit) is present on NodeMCU.
a) ESP8266 b) Atmega326
c) Atmega328P d) ESPN8266

(vii) Indicate, which among the following is a false statement regarding "Mechatronic system".
a) Its initial cost of setup is high b) Does not require highly skilled labours for operating it
c) More output in less time d) It provides flexibility in production

(viii) Write, how many principle axes do a Cartesian robot has.
a) 2 b) 3
c) 4 d) 5

(ix) Write, what does SCARA stand for in terms of industrial mechatronic robots.
a) Selectively Compliance Assembled Robot Arm b) Selective Complicated Assembly Robot Arm
c) Selective Compliance Assembly Robot Arm d) Static Complicated Assembly Robot Arm

(x) Write, how many degrees of freedom do an industrial SCARA (Selective Compliance Assembly Robot Arm) has.
a) 3 b) 5
c) 4 d) 9

(xi) Identify, in FEM, which option is the most realistic representation of the actual force between deformable bodies.
a) Point load b) Uniformly varying load
c) Sine distribution d) Uniformly distributed load

(xii) Recall: fluid power circuits use schematic drawings to
a) Simplify component function details b) Make it so only trained persons can understand the functions
c) Make the drawing look impressive d) Make untrained person to understand

(xiii) Recall: a pneumatic symbol is
a) Different from a hydraulic symbol used for the same function b) The same as a hydraulic symbol used for the same function
c) Not to be compared to a hydraulic symbol used for the same function d) None of the mentioned

(xiv) Indicate: Most hydraulic circuits
a) Operate from a central hydraulic power unit b) Use air-over-oil power units
c) Have a dedicated power unit d) Does not have dedicated power unit

(xv) Indicate: Hydraulic and pneumatic circuits
a) Perform the same way for all functions b) Perform differently for all functions
c) Perform the same with some exceptions d) Does not perform all the functions

Group-B
(Short Answer Type Questions) 3 x 5=15

2. Describe the working of techo generator. (3)

3. Describe pneumatic system and the various components of pneumatic system. (3)

4. Illustrate the factors to be considered for selecting compressors. Describe the types of compressor. (3)

5. Construct the basic function of control system and then write about the requirements of control system. (3)

6. Write the difference between traditional design approach and Mechatronics approach. (3)

OR

Write, how can a traditional design of temperature control of a domestic central heating system is improved by mechatronic design. (3)

Group-C
(Long Answer Type Questions) 5 x 6=30

7. Illustrate, how has the integration of Mechatronics technology impacted the manufacturing industry in terms of efficiency and productivity. (5)
8. Explain, how can we determine the transfer function and frequency response of a system ? (5)
9. Explain Transfer Function of an Operational Amplifier. (5)
10. Explain hydraulic systems and how it works. (5)
11. Mathemetically evaluate the transfer function of a closed loop system. (5)
12. Write some of the challenges faced in implementing a Mechatronics system in a manufacturing setting and how can they be addressed. (5)

OR

Validate, how do traditional mechanical and electrical systems compare to Mechatronics systems in terms of cost, performance, and reliability? (5)

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