



المادة : مواضيع مختارة 2

التاريخ: 2019 / 9 / 17

الزمن: ساعتان

القسم : التحكم

أسئلة الامتحان النهائي

لطلبة الفصل: السابع رمز المادة: CT471

إسم الأستاذ: ز. شنيب/ ع. عاشور/ ح. عمر

رقم القيد :

الفصل الدراسي : ربيع 2019

إسم الطالب :

Important Notes:

- This paper contains SEVEN questions in FIVE pages.
- Attempt ALL questions.
- Total Marks: 100



Q.1 [15 Marks] Multiple Choice Questions (MCQ):

1 Mark each

- In mechatronics system design, setting controller specifications means
 - Choosing sensor type.
 - Choosing actuator type.
 - Choosing control algorithm such as PID, Fuzzy etc.
 - None of the above.
- The following main dynamic characteristic(s) is usually considered in Mechatronics application of sensors.
 - Response time.
 - Rise time.
 - Time constant.
 - All of the above.
- The ability to give same output reading when same input value is applied repeatedly is known as
 - Stability.
 - Repeatability.
 - Accuracy.
 - Sensitivity.
- Which of the following form the basis of Electrical domain?
 - Current.
 - Resistance.
 - Inductance.
 - All of the above.
- Which of the following is not covered under Mechanical energy domain?
 - Distance.
 - Latent heat.
 - Force.
 - Size.
- It is the time required to come to an output value within the specified error level.
 - Response time.
 - Rise time.
 - Settling time.
 - None of the above.

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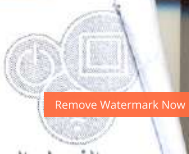
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Q.1 [15 Marks] Multiple Choice Questions (MCQ):

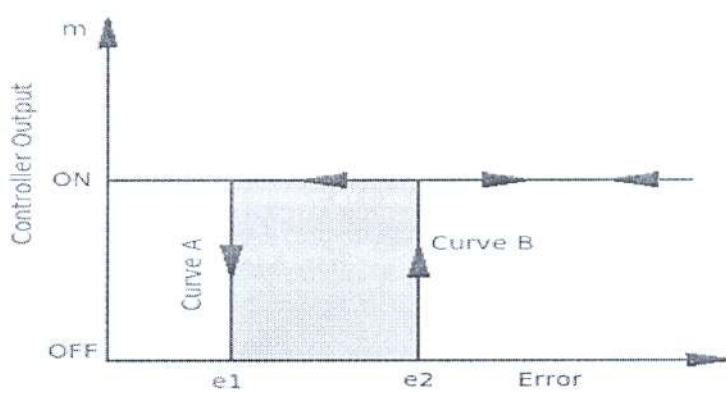
1 Mark each

1. In mechatronics system design, setting controller specifications means
 - a. Choosing sensor type. ()
 - b. Choosing actuator type. ()
 - c. Choosing control algorithm such as PID, Fuzzy etc. ()
 - d. None of the above. ()
2. The following main dynamic characteristic(s) is usually considered in Mechatronics application of sensors.
 - a. Response time. ()
 - b. Rise time. ()
 - c. Time constant. ()
 - d. All of the above. ()
3. The ability to give same output reading when same input value is applied repeatedly is known as
 - a. Stability. ()
 - b. Repeatability. ()
 - c. Accuracy. ()
 - d. Sensitivity. ()
4. Which of the following form the basis of Electrical domain?
 - a. Current. ()
 - b. Resistance. ()
 - c. Inductance. ()
 - d. All of the above. ()
5. Which of the following is not covered under Mechanical energy domain?
 - a. Distance. ()
 - b. Latent heat. ()
 - c. Force. ()
 - d. Size. ()
6. It is the time required to come to an output value within the specified error level.
 - a. Response time. ()
 - b. Rise time. ()
 - c. Settling time. ()
 - d. None of the above. ()



7. If a pole is located at $s = -5$ in left-hand plane (LHP), how will it be represented in Laplace domain? ()
a. $1/s + 5$. ()
b. $1/s - 5$. ()
c. $s/s + 5$. ()
d. $s/s - 5$. ()
8. In second order system, which among the following remains independent of gain (k)? ()
a. Open loop poles. ()
b. Closed loop poles. ()
c. Both a and b. ()
d. None of the above. ()
9. State model representation is possible using ()
a. Physical variables. ()
b. Phase variables. ()
c. Canonical state variables. ()
d. All of the above. ()
10. Which method is used for stability analysis? ()
a. Nyquist criteria. ()
b. Root locus method. ()
c. Routh Hurwitz criteria. ()
d. All of the above. ()

11. Consider the following graph of Controller Characteristics of On-Off Control. The region shown between curve A and curve B is called,



- a. Dead zone. ()
b. Hysteresis. ()
c. Both a. and b. ()
d. None of the above. ()



12. If the value of error increases, the changing speed of controller output

- a. increases. ()
b. decreases. ()
c. remains constant. ()
d. Cannot say. ()

13. How are DCV's classified?

- a. Signaling elements. ()
b. Processing elements. ()
c. Power elements or final control elements. ()
d. None of the above. ()

14. If a relief valve has reliability of 0.989, how many failures are expected in testing 1000 such relief valves?

- a. 111. ()
b. 100. ()
c. 10. ()
d. 11. ()

15. Interfacing input devices with microcontrollers may require

- a. Drive circuits. ()
b. Signal conditioning circuits. ()
c. All of the above. ()
d. None of the above. ()



pdfelement

Q.2 [28 Marks] Complete the following:

2 Marks each

1. Mechatronics applications include:

.....
.....

2. List the types of belts.

.....
.....

3. Mention any four statements about the problem definition.

.....
.....

4. What are the stages in designing a mechatronics system?

5. What are the gain margin and phase margin? How they enable to analyze control system stability?

6. Mention any four statements about the problem definition.

7. Name the two barriers used in automatic car parking system and state its uses.

8. Define transfer function.

9. What are the various movements of robots?

10. Why do we need to take care while using derivative control?

11. Discuss the possible design solutions for a pick and place robot?

12. Define degrees of freedom.

13. Differences between codes and standards are:

14. Programmable logic devices for mechatronics systems are:





Q.3 [6 Marks] What are the main advantages and disadvantages of mechatronics?

Q.4 [7 Marks] Group the followings into Mechanical systems, Electronic systems and Information technology:

1. Automation.
2. Mechanical elements.
3. Software engineering.
4. Precision mechanics.
5. Microelectronics.
6. Artificial intelligence.
7. Sensors and actuators.



Q.5 [7 Marks] Compare the control system performance for a system with proportional control and system with integral control.

Q.6 [12 Marks] Discuss the following actuation system:

1. Self-excited wound field shunt configuration de motor.
2. Self-excited wound field series configuration de motor.
3. Stepper motor.
4. Induction motor.

Q.7 [25 Marks]

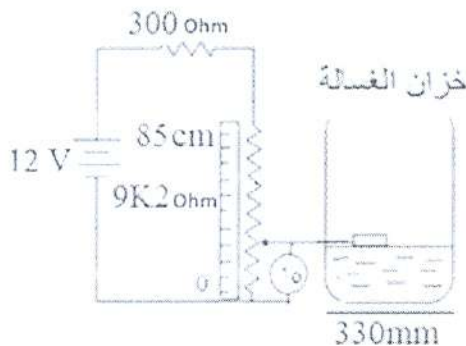
غسالة ملابس بها خزان ركب به عدة مجسات منها حساس حرارة ZED33 بحساسية قدرها $12.3mV$ و تعمل في المدى الحراري ($20C \sim 90C$) ، وكذلك مقاومة متغيرة ركببت لتحديد مستوى السائل بالخزان كما هو مبين بالرسم ركب المجسين بعد دوائر التهيئة بمحول اشارة تماثلي/ رقمي مرجعيته ($0 \sim 5V$) ، ودائرة ضوئية لشق وحيد لتوليد نبضات لعداد ثنائي لقياس عدد اللفات و سرعة دوران الخزان في الدقيقة.

أ) احسب قيمة V_0 عند مستوى $27cm$ وقيمة الخرج الرقمي لمحول الإشارة.

ب) احسب قيمة الخرج الرقمي عند الحرارة $85^\circ C$.

ج) احسب سرعة دوران الخزان في حالة العدد الثنائي للعداد

هو 011010 و زمن أخذ العينة هو $0.2s$.



END OF QUESTIONS