Tanta University
Faculty of Engineering
Mechanical Power Eng. Dept.

Semester Final Exam – 4th Year
Elective Course(2)– Fuel Systems
January 23, 2010 - Time: 3 hours

Answer the following questions. Assume any necessary assumptions. Marks

1. a) Draw the chemical structural formula of the following hydrocarbons; [8]
   i) n-octane ii) Propylene iii) Benzene
   What is the main group hydrocarbon family of each one?
   b) What are the typical end products from crude oil?

2. Discuss each of the following items; [12]
   a) Gasoline additives and their functions.
   b) Parameters that affected by gaseous fuel burner design.
   c) Stability diagram for single-port gaseous fuel burner of a premixed flame.

3. Explain each of the following; [12]
   a) Steps of spray breakup mechanism.
   b) Spray characteristics and their importance in liquid fuel combustion process.
   c) Types of Diesel engine fuel injection nozzles.

4. Discuss briefly each of the following; [8]
   a) Emissions from oil-fired furnaces.
   b) Analysis and testing of solid fuel.

5. a) Describe briefly each of: [12]
   i) Types of stoker fired boilers.
   ii) Types of fluidized bed combustion systems.
   b) Using simple diagrams, illustrate methods of locating and different burner configuration of dry bottom pulverized coal furnaces in large capacity boilers.

6. Coal water slurry contains 70% dry powder bituminous coal and 30% water. The coal has a dry higher heating value of 30000kJ/kg and contains 5% (weight) hydrogen of 142000kJ/kg, Find the higher and lower heating value of the slurry. Neglect any ash in the coal. [8]

Good luck,

Prof. Dr. S. H. El-Emam

Tanta University
Faculty of Engineering
Mechanical Power Eng. Dept.

Semester Final Exam – 4th Year
Elective Course(3)– Fuel Systems
January 23, 2010 - Time: 3 hours

Answer the following questions. Assume any necessary assumptions. Marks

1. a) Draw the chemical structural formula of the following hydrocarbons; [15]
   i) n-octane ii) Propylene iii) Benzene
   What is the main group hydrocarbon family of each one?
   b) What are the typical end products from crude oil?
   c) Describe briefly types of solid fuels.

2. Discuss each of the following items; [15]
   a) Gasoline additives and their functions.
   b) Parameters that affected by gaseous fuel burner design.
   c) Stability diagram for single-port gaseous fuel burner of a premixed flame.

3. Explain each of the following; [15]
   a) Steps of spray breakup mechanism.
   b) Spray characteristics and their importance in liquid fuel combustion process.
   c) Types of Diesel engine fuel injection nozzles.

4. Discuss briefly each of the following; [15]
   a) Emissions from oil-fired furnaces.
   b) Analysis and testing of solid fuel.
   c) Rank and grade classifications of coal.

5. a) Describe briefly each of the following; [15]
   i) Types of stoker fired boilers.
   ii) Types of fluidized bed combustion systems.
   b) Using simple diagrams, illustrate methods of locating and different burner configuration of dry bottom pulverized coal furnaces in large capacity boilers.

6. Coal water slurry contains 70% dry powder bituminous coal and 30% water. The coal has a dry higher heating value of 30000kJ/kg and contains 5% (weight) hydrogen of 142000kJ/kg, Find the higher and lower heating value of the slurry. Neglect any ash in the coal. [10]

Good luck,

Prof. Dr. S. H. El-Emam

Tanta University

Faculty of Engineering

Department of Mechanical Power Engineering

Year: Fourth Subject: Automatic Control

Name: Z.M. Omara

Date: 3-2-2010

Time allowed: 3 Hours

Full Marks : 90

Final Exam: pages 2

Academic Number: MEP4121

Question No 1

(marks 10)

Sketch the physical and block diagrams of an air–conditioning system where the driver sets the desired interior temperature on a dashboard panel. Identify the function of each element of the thermostatically controlled cooling system.

Question No 2

(marks 20)

2-a) Draw sectional view of following devices:
Contactor – Circuit breaker - Relay – Timer
giving the name of its main parts? And explain the working mechanism of each one.

2-b) Draw control and power circuits for two motors (10 A), these motors pump the water to tank, where the first motor works10 minutes and stop, then the other motor works 10 minute and so on.

Question No 3

(marks 20)

3-a) Derives the overall transfer function of the block diagram shown in Fig. (1), by using block diagram reduction.

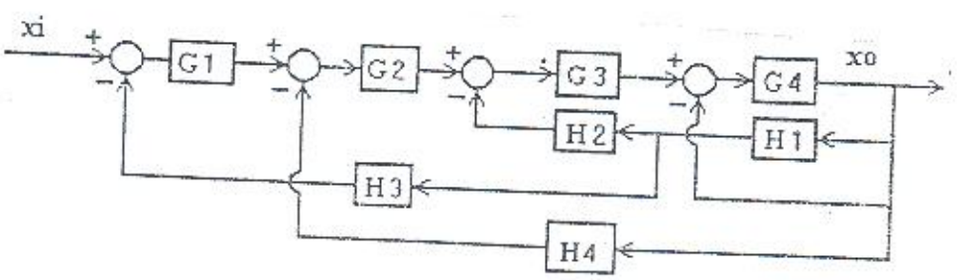


Fig. (1) Closed-loop control system

3-b) Use Mason's law to find out the transfer function of the control system shown in Fig. (2).

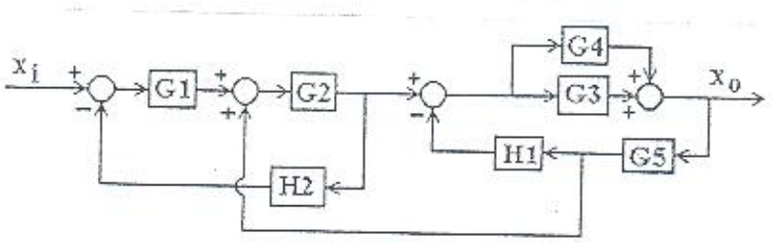


Fig. (2) Closed-loop control system

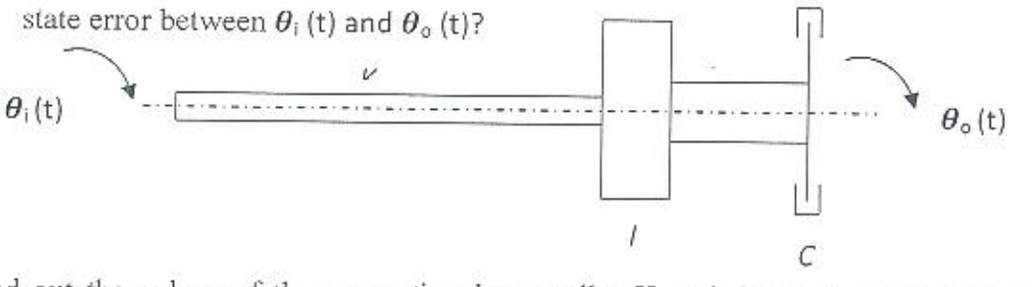
Question (4) (20 Degree)

a) A torsional spring of stiffness *K*, a mass of moment of inertia I and a fluid damper with damping coefficient C are connected together as shown in the figure. The angular displacement of the free end of the spring is θ_i (t) and the angular displacement of the mass and the damper is θ_o (t).

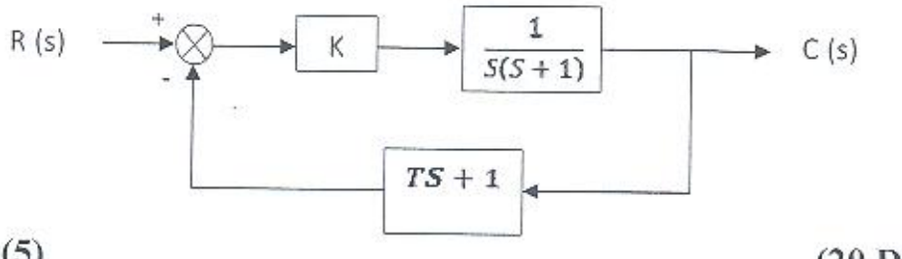
Given that K = 250 Nm/rad, I = 2.5 Kg.m^2, and C = 12.5 Nm s/rad

I. Develop the transfer function relating $\theta_i(s)$ and $\theta_o(s)$.

II. If the time relationship for θ_i (t) is given by θ_i (t) = 4t then find an expression for the time response of θ_o (t). Assume zero initial conditions. What is the steady state error between θ_i (t) and θ_o (t)?



b) Find out the values of the proportional controller K and the time constant T in the control system shown in the figure, to get a peak time of 1 Sec and a first overshoot of 20%.



Question (5) (20 Degree)

a) If the characteristic equation of a closed loop control system is in the form:

$$S^6 + 6S^5 + 37S^4 + 72S^3 + 327S^2 + 162S + 675 = 0$$

Determine the stability condition for the system using the Routh-Hurwitz stability criterion, and then determine the roots of the characteristic equation.

b) The open-loop transfer function for a control system is

$$G(s)H(s) = \frac{K}{S(S^2 + 4S + 13)}$$

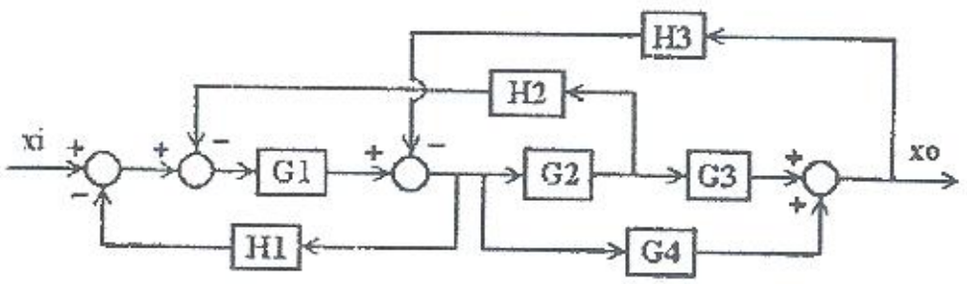
Find the asymptotes and angles of departure and hence sketch the root locus diagram. Locate a point on the complex locus that corresponds to a damping ratio of 0.25 and hence find: 1- The value of K at this point 2- The value of K for marginal stability

ميكانيكا قوى قديم

Tanta University	Department: Mech.Power Eng.	Faculty of Engineering
Course Title: Automatic Control.	Course Code: MP4102	Year: 4th (Old List.)
Date: Feb. 3, 2010	Allowed time: 3 hrs Marks: 70	No. of Pages: 1

1-Draw each of the physical system and block diagram for: hydraulic controller, electronic differential amplifier and combined mechanical system (Spring- Damper – Mass). (14)

2- Using the Graphical Method ONLEY, find out the O.T.F. of the control system shown.



(14)

3- If the overall transfer function of a closed-loop control system is in the form:

$\frac{\Theta_o}{\Theta_i} = \frac{385}{0.125D^2 + 2.55D + 386}$ And the input Θ_i is a unit step signal, find out the following:

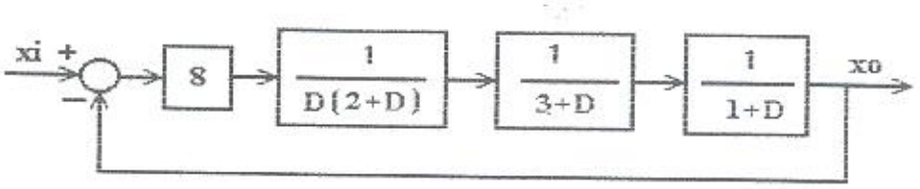
1) - Rise time (t_r).
2) - Peak time (t_p).
3) - Setting time (t_s) if the response allowance is ± 5 %
4) - Maximum peak (M_p).
5) - Steady –state error.

(14)

4- State the stability condition of a control system if its output is:

$X_o(D^4 + 5D^3 + 7D^2 + 5D + 6 = 2X_i$ (14)

5- Determine the stability condition of the system shown using HERWITZ stability method.



(14)

*** GOOD LUCK, DR.MOHAMMED ALLAM***

ميكانيكا قوى قديم

Tanta University
Faculty of Engineering
Mechanical Power Eng. Dept.

Semester Final Exam – 4th Year
Elective Course(2)– Fuel Systems
January 23, 2010 - Time: 3 hours

Answer the following questions. Assume any necessary assumptions. Marks

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Good luck,

Prof. Dr. S. H. El-Emam

ميكانيكا هوى قديم

Tanta University
Faculty of Engineering
Department of Mechanical Power Engineering
Year: Fourth Subject: Hydraulic Machines
Name: Z.M. Omara

Date: 27-1-2010
Time Allowed: 3 Hours
Full Marks : 100
Final Exam: pages 2
Academic Number: ME4103

Question No. 1 (marks 25)

1- a) Why the pump are used?

1- b) Draw sectional view of a centrifugal pump giving the name of its main parts? And explain the working mechanism of a centrifugal pump?

1- c) Draw an accurate section of an axial flow pump indicating the flow direction. What are the functions of upstream and downstream vanes?

1- d) The impeller of a centrifugal pump is 325 mm diameter and 19 mm wide at outlet. The blade angle at outlet is 35°, wheel speed 1600 rpm, suction left 1.5 m, and estimated loss of head on the suction side 2.1 m. The static lift from the pump center is 39 m and the delivery pipe losses 9.6 m. If the manometric efficiency of the pump 76% and the overall efficiency 68% find the discharge and power needed if both the suction and delivery pipes are 125 mm diameter.

Question No. 2 (marks 25)

2- a) What is meant by priming? Explain some of the important methods of priming?

3- b) Explain, starting the centrifugal pump?

2- c) Define and explain specific speed of centrifugal pumps?

2- d) When two water tanks, with a level difference of 10 m were connected by a pipe line, the discharge through the pipe line was 20 lit/sec. in order to increase the discharge; a centrifugal pump is used in the pipe line. The performance of the pump is given as follows:

$Q(m^3/sec.)$	0	0.01	0.02	0.03	0.04	0.05	0.06
Hm	27.5	27	26.5	24.75	22.5	20	17
η %	0	26	48	66	78	74	52

What will be the new discharge? Calculate the input power to pump in kW?

Question No. 3 **(marks 25)**

3- a) Explain, effect of air entrained on performance curves of centrifugal pumps?

3- b) Explain, how can one derive the performance characteristics curves for a given rotodynamic pump in practice.

3- c) The performance characteristics of a centrifugal pump is tabulated below:

Q (lit/sec.)	0	20	40	60	80	100	120	150
Hm	55	52	51	48	42.5	35	26	8
η %	0	45	70	74	70	60	48	10

If two of these pumps are used in a piping system having the following pipe resistance curve: $Ha=30+1.56x10^{-3} Q^2$. How would you connect these identical pumps to obtain the maximum discharge? And determine the total shaft power?

Question No. 4 **(marks 25)**

4- a) Explain types of stuffing box?

4- b) What do you understand by cavitation? What are its causes and how it can be prevent. Draw the performance curves of a centrifugal pump under cavitation conditions and explain NPSH of a centrifugal pump.

4- c) 4- c) Cavitation test were performed on a pump giving the following results : Q = 0.05 m^3/s , H = 37 m , barometric pressure 760 mm of mercury, ambient temperature 25 C°, cavitation began when the total head at the pump inlet was 4 m . Calculate the value of thoma cavitation coefficient and NPSH.
What could be the maximum height of this pump above water level if it is to operate at the same point on its characteristic in the ambient condition of the barometric pressure of 640 mm of mercury and temperature of 10 C°?

ميكانيكا قوى جديد

Tanta University
Faculty of Engineering
Department of Mechanical Power Engineering
Year: Fourth Subject: Hydraulic Machines
Name: Z.M. Omara

Date: 27-1-2010
Time Allowed: 3 Hours
Full Marks : 75
Final Exam: pages 2
Academic Number: MEP41 20

Question No. 1 (marks 19)

1- a) Why the pump are used?

1- b) Draw sectional view of a centrifugal pump giving the name of its main parts? And explain the working mechanism of a centrifugal pump?

1- c) Draw an accurate section of an axial flow pump indicating the flow direction. What are the functions of upstream and downstream vanes?

1- d) The impeller of a centrifugal pump is 325 mm diameter and 19 mm wide at outlet. The blade angle at outlet is 35°, wheel speed 1600 rpm, suction left 1.5 m, and estimated loss of head on the suction side 2.1 m. The static lift from the pump center is 39 m and the delivery pipe losses 9.6 m. If the manometric efficiency of the pump 76% and the overall efficiency 68% find the discharge and power needed if both the suction and delivery pipes are 125 mm diameter.

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2- c) Define and explain specific speed of centrifugal pumps?

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Hm	27.5	27	26.5	24.75	22.5	20	17
η %	0	26	48	66	78	74	52

What will be the new discharge? Calculate the input power to pump in kW?

Question No. 3 **(marks 18)**

3- a) Explain, effect of air entrained on performance curves of centrifugal pumps?

3- b) Explain, how can one derive the performance characteristics curves for a given rotodynamic pump in practice?

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If two of these pumps are used in a piping system having the following pipe resistance curve: $Ha=30+1.56\times10^{-3}\ Q^2$. How would you connect these identical pumps to obtain the maximum discharge? And determine the total shaft power?

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4- c) 4- c) Cavitation test were performed on a pump giving the following results : $Q = 0.05\ m^3/s$, $H = 37$ m , barometric pressure 760 mm of mercury, ambient temperature 25 C°, cavitation began when the total head at the pump inlet was 4 m . Calculate the value of thoma cavitation coefficient and NPSH.
What could be the maximum height of this pump above water level if it is to operate at the same point on its characteristic in the ambient condition of the barometric pressure of 640 mm of mercury and temperature of 10 C°?

جامعة طنطا
كلية الهندسة
قسم هندسة القوى الميكانيكية
الفرقة الرابعة (لائحة حديثة) - المادة : دراسات بيئية

التاريخ: ٢٥/ ١/ ٢٠١٥
الزمن : ثلاث ساعات
الدرجة العظمى : ٨٥ درجة
الامتحان النهائي في ورقتين

أجب عن الأسئلة الآتية:

السؤال الأول:

أ- ما مفهوم التلوث وما هي مستوياته وأنواعه ؟

ب- متى نطلق على الهواء أنه ملوثاً، وما هو دور أكاسيد النيتروجين وثاني أكسيد الكبريت (NO/SO_2) وكذلك الأوزون الأرضي في عملية التلوث ؟

ج- من العوامل المحدده لكثافة الملوثات الجوية شكل موقع مصدر التلوث، اشرح ذلك بالتفصيل؟

(١٥ درجة)

السؤال الثاني:

أ- اتباع الطرق الفنية من الطرق المستخدمة في ضبط التلوث الهوائي والتحكم، اشرح ذلك بالتفصيل.

ب- تكلم تفصيليا عن المجمع الميكانيكي (Mechanical Collector) في تنظيف المداخن؟

ج- تلوث المياه بالمخلفات الصناعية من مصادر تلوث المياه اشرح ذلك بالتفصيل.

د- ما المقصود بالطمر الصحي ، وما هى أهم الشروط التي يجب توافرها عند اختيار موقع طمر النفايات؟ وما هي أهم المزايا الايجابية لهذه الطريقة؟

(٢٥ درجة)

السؤال الثالث:

أ- تستقبل التربة كميات هائلة من المخلفات و الملوثات سنويا ، ويمكن تصنيف الملوثات حسب منشئها إلى ملوثات طبيعية و ملوثات بشرية أو صناعية، تكلم بالتفصيل عن الآثار المترتبة علي تدهور التربة وكذلك كيفية التحكم في تلوث التربة.

ب- التطبيقات الزراعية والصناعية للإشعاع من المصادر الصناعية للتلوث بالإشعاع ، تكلم عنها بالتفصيل؟

ج- للحد من مشكلة النفايات الصلبة وإدارتها إدارة سليمة لا بد من تحقيق مجموعة أهداف، حدد تلك الأهداف.

د- عند احتراق كمية من غاز البيوتان (C_4H_{10}) كانت كمية الهواء المستخدمة لحرق (١كجم) من الوقود تساوى ٢٠ كجم احسب :

١. نسبة الهواء الزائد (النسبة المئوية).

٢. النسبة الحجمية لغاز CO_2 الناتج.

٣. درجة الحرارة التي يبدأ عندها تكثيف لبخار الماء عندما يكون الضغط مساويا (1atm)

(٢٥ درجة)

السؤال الرابع:

أ- عرف التلوث البصري وأذكر بعض الأمثلة علي هذا النوع من التلوث.

ب- ما هو المبدأ الأساسي لمراقبة البيئة؟ وما هي فوائد مراقبة البيئة ضمن خطة طويلة الأمد؟

ج- ما المقصود بالطاقة القابلة للاسترجاع (المتجددة) والطاقة الغير متجددة، مع ذكر أنواع كلا منها؟ ثم اشرح فكرة عمل الخلايا الفولت ضونية؟

د - اشرح مع الرسم محطة توليد الطاقة الكهربائية باستخدام طاقة المد والجزر وأذكر مدى مساهمتها في العمل على تقليل التلوث؟

(٢٠ درجة)

مع التمنيات بالنجاح ،،،،، د/عبدا لقادر سعد