



2014



Course Title: **Machining Technology**
Course Code: MPD 3221
Year: 3rd – Production Engineering and Mechanical Design
2nd Term – Final Exam

Date: 16 June 2016
Total Marks: 90 Marks
Time allowed: 3 hrs
No. of pages: 2

Answer all the following questions. The neat sketches are considered a part of your answer

Q1: Choose the most correct answer (34 marks)

1. The process marks on the work surface are known as (substrate – surface textures – altered layer – surface integrity).
2. Parallel continuous linear surface marks are associated with (grinding – face milling – polishing – honing – broaching) operation, whereas cross-hatches marks are characteristic of (grinding – face milling – polishing – honing – shaping – broaching).
3. Surface integrity deals with studying effect of machining process on; (a) surface textures, (b) subsurface layer, (c) performance of the part, (d) a and b, (e) b and c, (f) a, b, and c.
4. (Milling and turning – Milling and grinding – Turning and boring – Turning and planning – Shaping and planning) produce similar range of surface roughness.
5. The “form” surface textures that appear during machining normally have (same – shorter – longer) wavelengths than the waviness features and it is caused by (tool marks – feed marks – thermal cracks – machine vibration – weight deflection – asymmetric forces).
6. Newly sharpened cutting edges (reduce cutting force and R_a – reduce cutting force and increase R_a – increase cutting force and R_a – increase cutting force and reduce R_a – have no effect) compared to used or dull edges.
7. (Broach speed – Pitch between teeth – Grinding of cutting edges – Taper of broach) is not of the parameters that affect surface roughness in broaching.
8. The soft grades of grinding wheels contain bond material proportion, P_b , (equal to – greater than – less than) that of the hard wheels.
9. (Diamond – Al_2O_3 – SiC – cBN) is the most common abrasive material used for grinding ceramics.
10. Creep grinding is used for grinding slots with (large depth-to-width – small depth-to-width – large width-to-depth – diameter-to-length) ratio. In this process, the depth of cut is (in the same order of – smaller than – larger than) surface grinding and the feed speed is (in the same order of – smaller than – larger than) surface grinding.
11. The advantage of double enveloping worm over the straight worm is that it (transmits loads through two skewed shafts – transmits greater loads – is cheaper – is easier in production).
12. The gear cutting tool receives a reciprocating motion in case of (rack and pinion shaping – rack shaping and broaching – broaching and hobbing – broaching only – rack shaping only).
13. In ultrasonic machining, the tool abrasion is compensated by (continuous slurry feeding – using finer abrasive particles – correction of tool feeding – increasing of vibration frequency – increasing the vibration amplitude).

Q2:

(3×4+6=18 marks)

- a. Why the surfaces are commercially and technologically important?
 - b. Name the evaluation techniques of surface integrity.
 - c. In a peripheral milling operation with tool diameter = 60 mm, number of teeth = 12, and the feed/tooth = 0.3 mm calculate the surface roughness (R_a) in case of the up- and the down cut.
 - d. Explain with sketches the principle of peripheral and face milling. Suggest one geometrical factor for the tool of each that may reduce the surface roughness.
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Q3:

(9+10=19 marks)

- 1) Explain with help of sketches the:
 - a) three mechanisms of grinding wheel wear
 - b) tree types of grain/work action
 - c) difference between the honing and the superfinishing.
 - 2) In a surface grinding operation, the grinding wheel has a diameter = 200 mm and width = 25 mm. The wheel rotates at 2400 rev/min, with a depth of cut (infeed) = 0.05 mm/pass and a cross feed = 3.50 mm. The reciprocating speed of the work is 6 m/min, and the operation is performed dry. Determine (a) length of contact between the wheel and the work and (b) volume rate of metal removed. (c) If there are 64 active grits/cm² of wheel surface, estimate the number of chips formed per unit time. (d) What is the average volume per chip? (e) If the tangential cutting force on the work is 25 N, compute the specific cutting energy?
-

Q4:

(9+10 = 19 marks)

1. With only clear sketches explain one gear production operation by:
 - a) metal forming, b) form cutting, c) generation cutting.
 2. In ECM process:
 - a) Explain with the aid of sketches the principle of the process.
 - b) Considering the efficiency of the electrical circuit, derive a relationship to calculate the tool feed rate.
 - c) Calculate the feed rate and the time required to cut 30 mm diameter and 10 mm deep circular hole through an aluminum plate. The operation is accomplished at 1200 amp current and the current efficiency was 93%. [The specific removal rate for Al, $C = 0.0344 \text{ mm}^3/\text{A.s}$]
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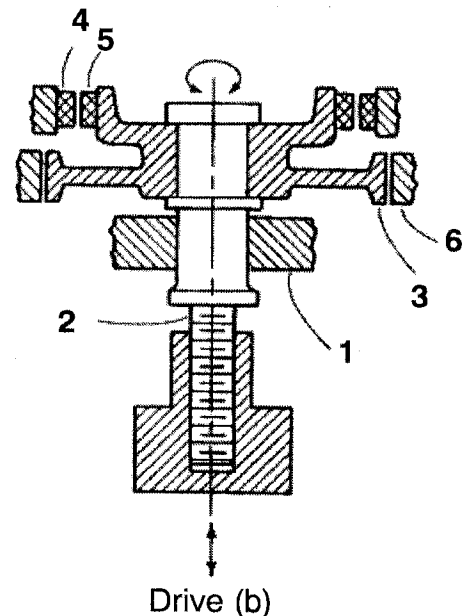
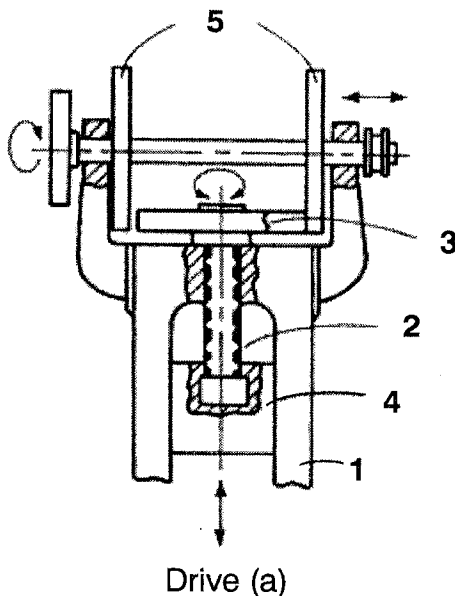
*Best wishes,
Assoc. Prof. Mahmoud Abmadein*

Final Exam - Forming Machines

Solve all questions:

Question 1 : (25 marks)

- a) Presses can be classified according to the production techniques used or on the basis to their control system. Give examples for each classification.
- b) What are the main factors that has to considered when selecting a press?
- c) The shown figures show two different types of a press drive.
 - i. What is the name of the press? And what are its typical fields of application?
 - ii. In a table form write down the two drive types and name the numbered parts.

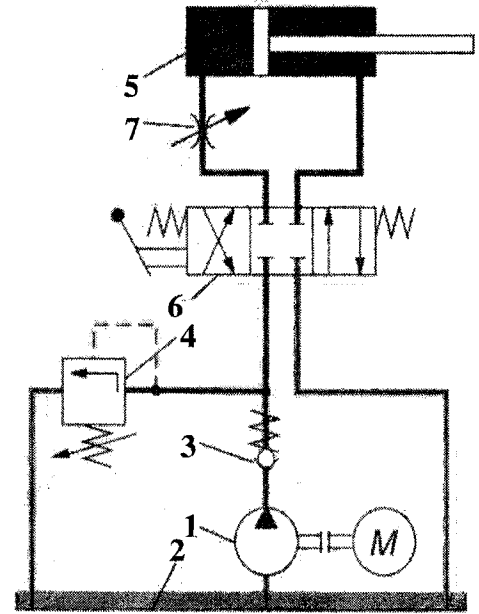


Question 2 : (20 marks)

- a) Draw and explain the method of action for two different types of load-limiting safety elements on an eccentric press frame.
- b) A crank press has different permissible press forces. Name these forces and differentiate between them on a characteristic curve of a crank press.
- c) With the aid of schematic drawings show the difference between a toggle drive press and a rocker-arm press.

Question 3 : (25 marks)

- a) Plot the displacement-time diagram of a hydraulic press showing the parts of a whole press cycle.
- b) Draw cushions and counter balance cylinders are important parts in the most common hydraulic presses. Talk about their functions.
- c) State the functional groups necessary to be controlled in a hydraulic press.
- d) For the given hydraulic circuit:
 - i. Name the numbered components.
 - ii. Explain the method of work of the circuit.
 - iii. For the parts (1), (2), (3) and (6) , what are the names and symbols of the equivalent electrical components for these parts.



Question 4 : (20 marks)

- a) Show with sketches the difference between an anvil hammer and a counterblow hammer.
- b) A drop hammer has a ram of mass 500 kg falls from a height of 1.25 m.
 - i. Calculate the contact velocity and the energy.
 - ii. If the return stroke time is 1.4 that of the fall time, calculate the number of strokes per minute.
 - iii. Compare the calculated fall time with that of a drop hammer having the same ram and falling height, however its ram is provided with a hydraulic piston of area 10 cm² and operates on pressure of 15 MPa.
- c) What are the fields of application for hammers you have studied.

مع تمنياتي بالتوفيق و النجاح

Final Exam - Forming Technology

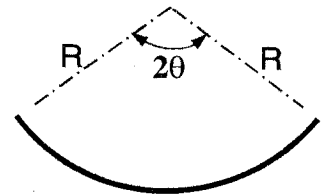
Solve all questions in the two pages:

Question 1 : (25 marks)

- Show through one plot the effect of cold working on:
 tensile strength – hardness – ductility – grain size
 of the formed material.
- What is the ideal microstructure for a steel wire to have before its drawing process? Explain with the aid of a T-T-T curve how can we reach that microstructure.
- Illustrate two different types of tube drawing.
- What are the advantages to use water as the transmitting medium in explosive forming?

Question 2 : (20 marks)

- Define: bloom – billet – slab – plate – sheet – strip
- Show with aid of sketches the possible defects when rolling with insufficient camber.
- The shown section of radius R is to be produced from a flat strip by contour rolling from one stage. The material has a modulus of elasticity of 200 GPa and a yield stress of 250 MPa.
 - Derive an expression for the maximum elastic strain value in the section.
 - If $R = 50$ cm and $\theta = 30^\circ$, what is the minimum distance between the two stations to prevent (نمنع) occurrence of wrinkles?
 - How can we reduce the distance between the two stations without increasing the strain?



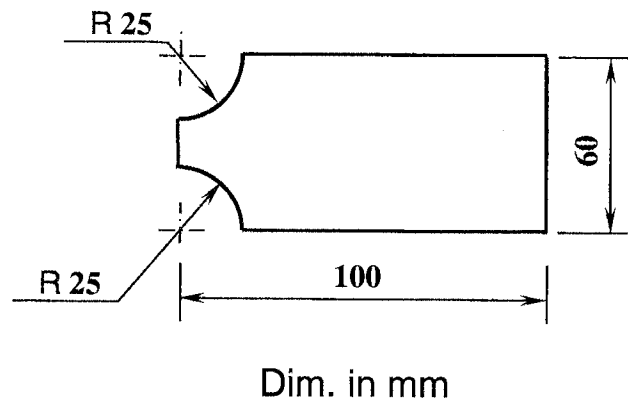
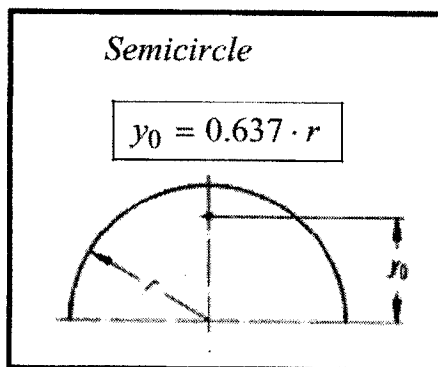
Question 3 : (20 marks)

- a) Explain with the aid of sketches the difference between the following forging processes:
Heading – Upsetting – Fullering
- b) Give two examples on how to control flow lines in forging.
- c) State the advantages and disadvantages of rubber forming.

Question 4 : (25 marks)

The shown product is required to be produced in mass production from mild steel strips of width 80 mm and thickness 2 mm. The used steel has a shearing resistance of 200 MPa.

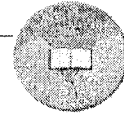
- i. Suggest a suitable die-set to produce the product.
- ii. Calculate the required force according to your die-set selection.
- iii. Determine the pressure line of action.
- iv. Draw a simplified section of the die-set.
- v. Show with neat sketches the possible defects in the sheared part.



مع تمنياتي بالتوفيق و النجاح
د. نادر الليثي



2, E, 1, 2



TANTA UNIVERSITY
FACULTY OF ENGINEERING

DEPARTMENT OF: **Production Engineering & Mech. Design Dep.**
EXAMINATION (3 YEAR) STUDENTS OF **Production ENGINEERING**

COURSE TITLE: **Mechanical Design (3)**

COURSE CODE: **PMD3219**

DATE: 12-06-2016

TERM: Second term

TOTAL ASSESSMENT MARKS: 75

TIME ALLOWED: 3 HOURS

Notes:

1/2

It is allowing for student to use bearing table and only one text book

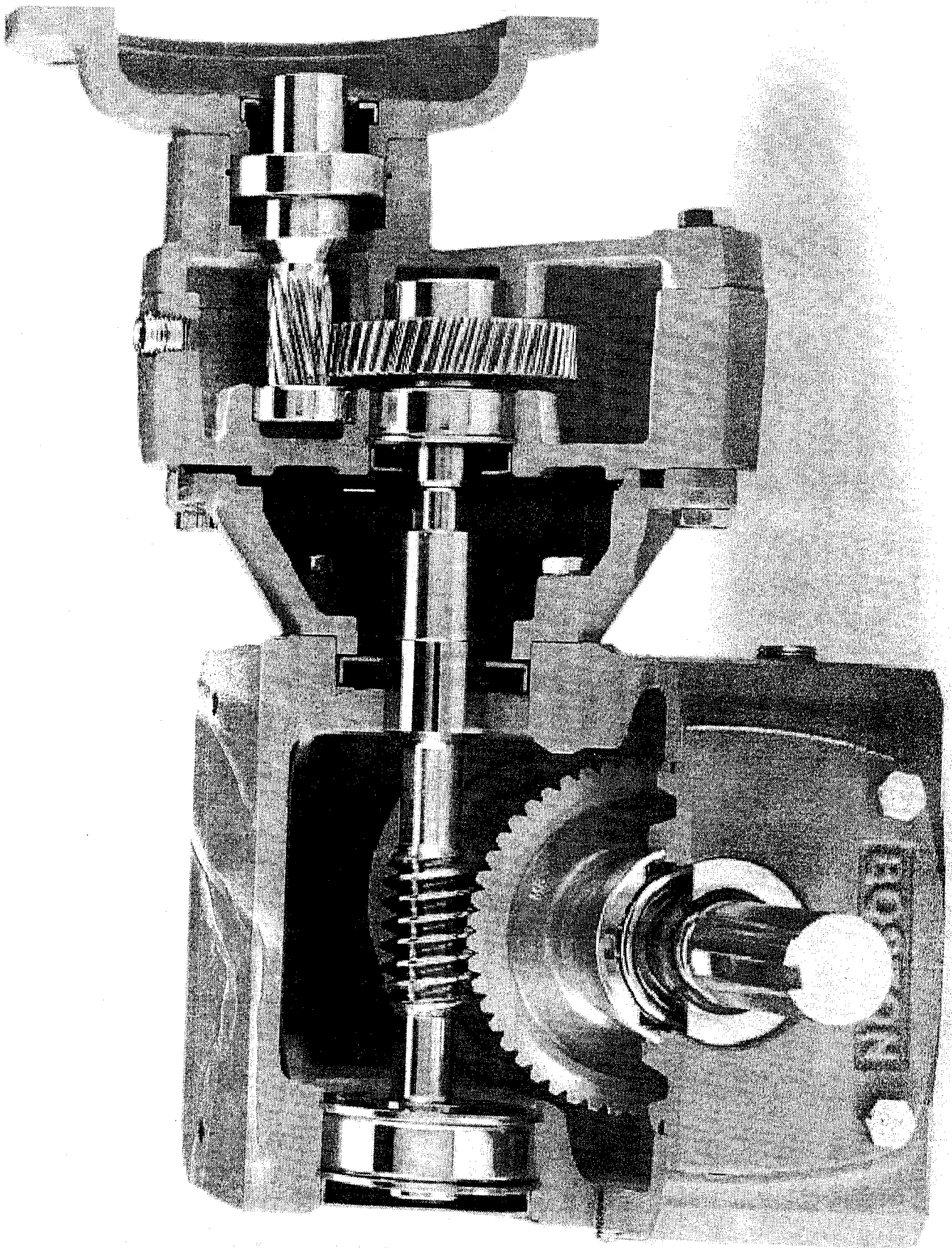
Systematic arrangement of calculations and clear neat drawings are essential.

Any data not given is to be assumed -- Answer as many questions as you can. Answer as brief, as possible.

Q 1: - It is required from you to design elevator gearbox with a total speed reduction of 40, and you can have only two types for gearbox configurations; one is two step helical gears and the other is one step worm and worm gear. So;

1. Which type do you choose and explain your answer scientifically? (5%)
2. Which one do you expect that will have longer lifetime and why? (5%)
3. Which one do you expect that will have smaller size and why? (5%)
4. Which one will have higher efficiency and Justify your answer? (5%)
5. Which one will have lower cost and why? (5%)
6. If the gearbox will be used to pull large ship hook with input power 350KW so; which one of the above gearboxes do you chose and why? (5%)
7. If the gearbox will be used to pull containers horizontally so; which one of the above gearboxes do you chose and why? (5%)
8. In case 7 it was required to have the input shaft perpendicular to the output shaft what is the configuration do you chose I- two step helical then bevel II- two step bevel then helical III- two step helical then spiral IV- worm and worm gear? Justify your answer. (5%)
9. Design both the above gearboxes (one is two step helical gears and the other is one step worm and worm gear configurations) and also design the gearbox shown below and compare between these designs. Use an input power of 15KW electrical motor. (40%)
10. Draw a full contracture for one of the above designed gear boxes (40%)

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Tanta University
Second Term Exam
Time Allowed: 3hrs

Automatic Control of Mechanical Systems

3rd Year Production Engineering and
Mechanical Design Department

Course Code: MPD3223

Total Assessment Marks: 85



Faculty of Engineering
Production Engineering and
Mechanical Design Dept.
June 9, 2016

Please, answer the following questions:

Question (1)

(20Marks)

Figure 1 shows the elements of a closed-loop temperature control system. A proportional controller compares the desired value $\theta_i(t)$ with the measured value $v_o(t)$ and provides a control signal $u(t)$ of K_1 times their difference to actuate the valve and burner unit. The heat input to the oven $Q_i(t)$ is K_2 times the control signal.

The walls of the oven have a thermal resistance R_T and the oven has a thermal capacitance C_T and operating temperature $\theta_o(t)$. The heat transfer equation for the oven may be written as:

$$Q_i(t) - \frac{\theta_o(t)}{R_T} = C_T \frac{d\theta_o}{dt}$$

The thermometer and measurement system feed a measured value of H_1 times $\theta_o(t)$ to the controller. The system parameters:

$$\begin{aligned} K_1 &= 5 & K_2 &= 1.5 \text{ J/V} & H_1 &= 1 \text{ V/K} \\ R_T &= 2 \text{ K/J} & C_T &= 25 \text{ Js/W} & & \end{aligned}$$

- Draw the block diagram of the system and obtain the transfer function for each component, then find:
- The open-loop time constant
- The closed-loop time constant
- The percentage steady-state error in the output when the desired value is constant $\theta_i(t) = C$

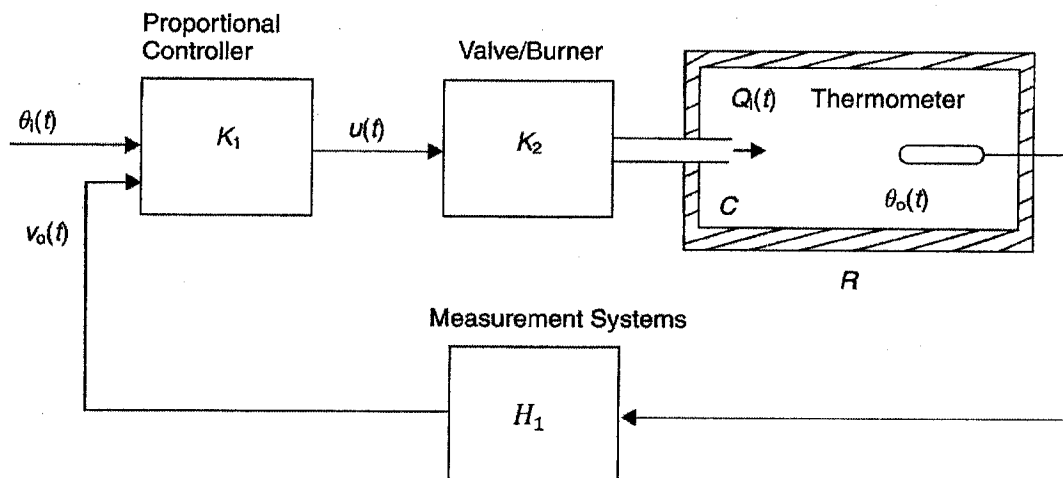


Fig. 1. Closed-loop temperature control system

Question (2)

(15Marks)

Figure 2 shows a crane hoisting a load. Although the actual system's model is highly nonlinear, if the rope is considered to be stiff with a fixed length L , the system can be modeled using the following four equations:

$$m_L \ddot{x}_{La} = m_L g \varphi$$

$$m_T \ddot{x}_T = f_T - m_L g \varphi$$

$$x_{La} = x_T - x_L$$

$$x_L = L\varphi$$

Where m_L is the mass of the load, m_T is the mass of the cart, x_T and x_L are displacements as defined in Fig. 2, φ is the rope angle with respect to the vertical, and f_T is the force applied to the cart.

- Obtain the transfer function from cart velocity to rope angle $\Phi(s)/V_T(s)$
- Assume that the cart is driven at a constant velocity $v_T(t) = V_0$, obtain an expression for the resulting $\varphi(t)$. Show that under this condition, the load will sway (oscillate) with a frequency $\omega_0 = \sqrt{g/L}$

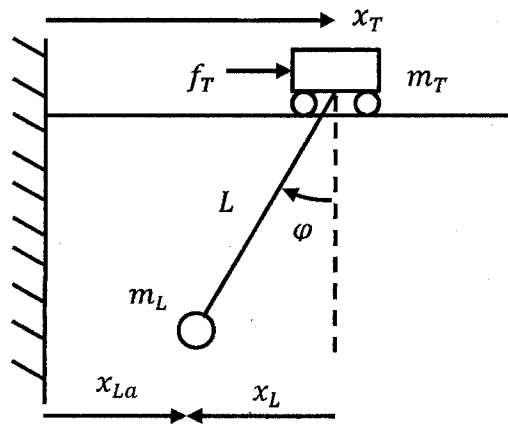


Fig. 2. A crane hoisting a load

Question (3)

(10Marks)

Find the equivalent transfer function $C(s)/R(s) = G(s)$ for the system shown in Fig. 3.

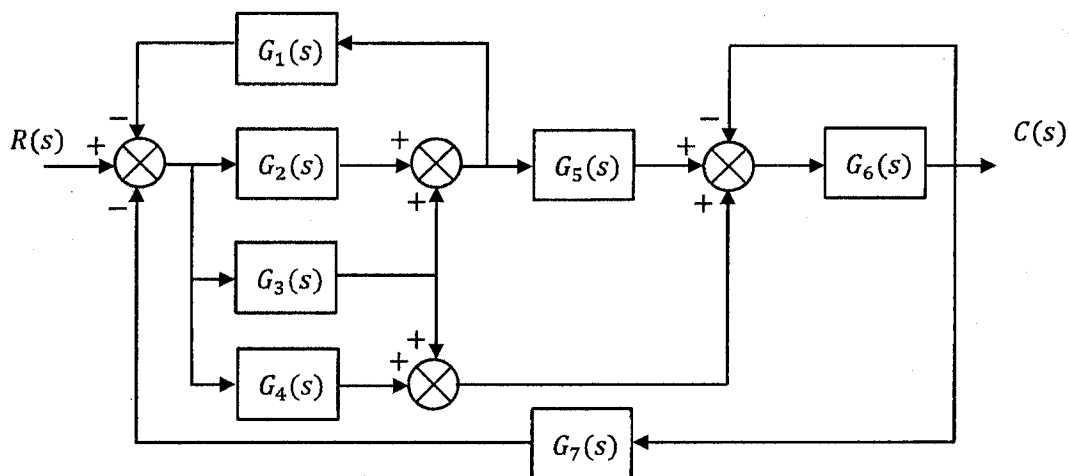


Fig. 3. Block diagram of question (2)



Course Title: laws and legislations
Course Code: MPD32H4
Year: 3rd Year Production

Date: 5 - 6 - 2016
Allowed time: 2 hrs.
No. of pages: 1

Final term Exam

اجب عن الاسئلة الاتية :

(١٥ درجة)

السؤال الاول :

- ١- اكتب ماتعرفه عن لفظ القانون وتعدد معانيه؟
- ٢- اذكر خصائص القانون واهم اقسامه وفروعة المختلفة؟
- ٣- تكلم عن وظيفة القانون و غايته؟

(١٥ درجة)

السؤال الثانى :

١. ان قيمة العرف لا تتضح الا على ضوء المقارنة بمكانة التشريع ، فالمزايا التى تنسب للعرف هى فى ذات الوقت عيوب فى التشريع. و عيوب العرف هى مزايا التشريع.
- ✓ فى ضوء ماسبق وضح مايلى :
- مزايا و عيوب العرف؟
- المقصود بالعرف وحجية العرف ؟
- شروط العمل بالعرف؟

(١٠ درجة)

السؤال الثالث :

- ١- اذكر ماتعرفه عن تفسير القانون ؟ مع شرح مبسط للانواع المختلفة له؟
- ٢- عرف العقد؟
- ٣- اذكر اركان العقد مع شرح مبسط ؟

With my best wishes