

### Final Exam - Forming Machines

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**Solve all questions – The exam is in two pages:**

**Question 1 : ( 20 marks )**

- With the aid of neat sketches differentiate between two common types of screw press drives.
- What are the advantages of screw presses compared to hammers?
- State some typical fields of application of screw presses.

**Question 2 : ( 25 marks )**

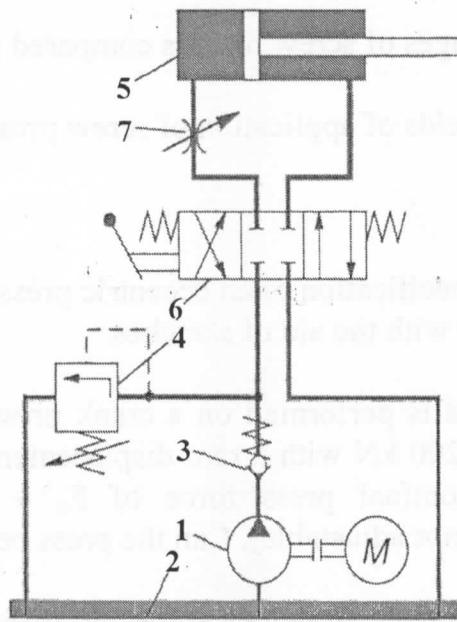
- What are the main specifications of an eccentric press?  
Explain your answer with the aid of sketches.
- An extrusion process is performed on a crank press. The process has maximum press force of  $F = 1200$  kN with a ram displacement of  $h = 20$  mm. The press is available with a nominal press force of  $F_n = 2000$  kN and a stroke of  $H = H_{adj} = 200$  mm (not adjustable). Can the press be used for this operation?
- With the aid of schematic drawings show the difference between knuckle-lever press and toggle drive press.

**Question 3 : ( 20 marks )**

- Show with sketches the difference between an anvil hammer and a counterblow hammer.
- A drop hammer has a ram of mass 500 kg falls from a height of 1.25 m.
  - Calculate the contact velocity and the energy.
  - If the return stroke time is 1.4 that of the fall time, calculate the number of strokes per minute.
  - 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  $10 \text{ cm}^2$  and operates on pressure of 15 MPa.
- Give three different examples of ram lifting mechanisms in hammers.

**Question 4 : ( 25 marks )**

- a) What are the advantages of hydraulic systems over other methods of power transmissions for presses.
- b) What are the functional structure of the control system for a press?
- c) 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.



مع تمنياتي بالتوفيق و النجاح

د. نادر الليثي

**Final Exam - Forming Technology**

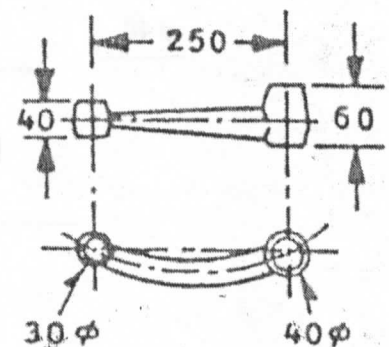
**Solve all questions in the two pages:**

**Question 1 : ( 20 marks )**

- Differentiate between cold- and hot-working processes. State the advantages of each type.
- A trapezoidal section with bends of 10 cm width each is to be produced by contour rolling. The distance between the two stations is 1 m. The inclination angle of both bends is  $30^\circ$ . The material has a modulus of elasticity of 200 GPa and a yield stress of 250 MPa.
  - Plot the change of the strain and stress along the contour.
  - Is it recommended to use the given rolling conditions? Justify your answer.
  - What are the actions to be done in order to have a successful rolling process.

**Question 2 : ( 25 marks )**

- State the forces exerted during fine blanking.
- Explain with the aid of sketches the difference between the following forging processes:  
heading – fullering – edging
- It is required to produce the shown connecting rod.
  - Show with aid of neat sketches how the part is produced.
  - State the advantages of the method you choosed.



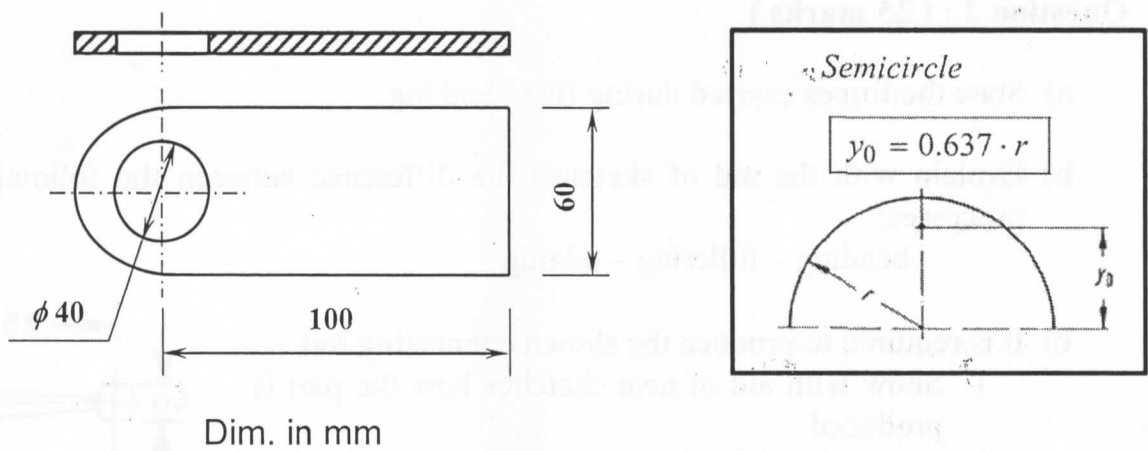
**Question 3 : ( 20 marks )**

- With the aid of sketches show the main types of rolling mills.
- What is the ideal microstructure for a steel wire to have before its drawing process?
- With the aid of neat sketches differentiate between different types of tube drawing.

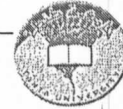
**Question 4 : ( 25 marks )**

The shown product is required to be produced in mass production from mild steel strips of width 60 mm and thickness 2.5 mm. The used steel has a shearing resistance of 300 MPa.

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



مع تمنياتي بالتوفيق و النجاح  
د. نادر الليثي



TANTA UNIVERSITY  
FACULTY OF ENGINEERING

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

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

COURSE CODE: **MPD3219**

DATE: 14-06-2014

TERM: Second term

TOTAL ASSESSMENT MARKS: 75

TIME ALLOWED: 3 HOURS

1/2

Notes:

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

Systematic arrangement of calculations and clear neat drawings are essential.

الإمتحان مكون من ٣ أسئلة في صفتين وورقتين

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

**Q 1:- (20%)**

A pair of 20-deg. full-depth spur gears is made of 0.40% C Nickel-chromium steel with a BHN of 400. The face width is 60 mm, and the module is 6 mm. The pinion has 20 teeth and turns at 20 rev/s. The speed reduction is 3. What power can be transmitted on the basis of strength and surface durability?

**Q 2 :- (20%)**

Two meshing helical gears have a normal pressure angle of 20 deg., a normal module of 3 mm, and a face width of 60 mm. The center distance is 380 mm. Number of pinion teeth 50. Both gears are made of 0.4%C steel hardened to 250 BHN. Pinion turns at 15 RPS. Determine the power capacity of the gears and the out put torque?

**Q 3 :- (40%)**

A gear train consists of a triple-threaded worm that drives a worm wheel having 75 teeth. A bevel gear is mounted on the same shaft as the worm wheel. The total velocity ratio for the gear train is to be 100. The worm has an input of 5 kW at 25 RPS and the efficiency of the bevel gear train is 95%.

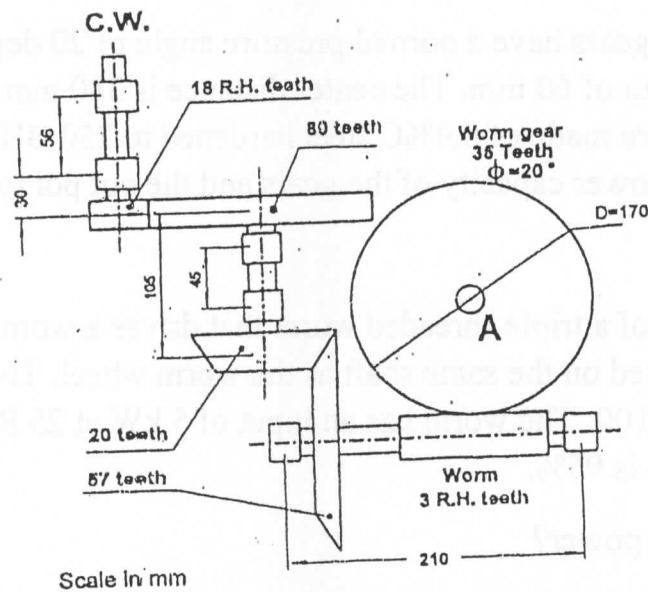
- Find the output power?
- Make a complete design for the gears.
- Calculate the diameters of the shafts and select appropriate antifriction bearings?

**Turnover to the next page!!!!**

**Q 4 :- (50%)**

The figure shows a gear train consisting of helical gears, bevel gears, and a worm and worm gear. The helical pinion rotates at 1520 RPM in the direction shown.

1. Find the speed and direction of rotation of the worm gear.
2. Determine the axial and radial loads on worm gear axis "A" when the input power to the helical pinion is 1 kW. (The coefficient of friction between worm and the worm gear may be taken 0.05).
3. What is the maximum power, which could be transmitted by this gear train at the same input speed? In case of the worm was made of steel with BHN 500 and the worm gear was made of phosphor bronze.
4. Calculate the forces on all bearings and select the type and the size of all bearings based on 1000 hr life of the gear box and the maximum power.
5. Draw a free hand sketch for the worm shaft construction?



Course Title: Machining Technology  
Date: Jun 2014 (Second term)Course Code: MPD3221  
Allowed time: 3 hrsYear: 3<sup>rd</sup>  
No. of Pages: (2)

**Remarks:** (answer the following questions... assume any missing data... answers should be supported by sketches)

**Problem number (1) (20 Marks)**

- a) Write short notes on surface finishing processes and explain in details:  
Lapping, Honing, Superfinishing, Polishing, Buffing, Scraping and Electroplating. (5 Marks)
- b) Mention the types of surfaces. Why surfaces are important in machine technology? (5 Marks)
- c) Which of the following operations is also known as internal turning?  
a) Milling                      b) Tapping                      c) Boring                      d) facing (2.5 Marks)
- d) Match list I with list II and select the correct answer using the codes given below this lists:  

List I (Machining Process)	List II (Related to)
A. Boring	1. Multiple tooth-cutter
B. Milling	2. Cutting a piece into two parts
C. Reaming	3. Enlargement of a hole
D. Parting	4. Finishing of a hole

Codes: A	B	C	D
(a) 3	2	4	1
(b) 3	1	4	2
(c) 4	1	3	2
(d) 4	2	3	1

  
 (2.5 Marks)
- e) Consider the following statements:  
 1. Using helical-tooth cutter, tool vibration and chatter are minimum.  
 2. A helical-tooth cutter produces a smooth surface.  
 3. A straight-tooth cutter produces continuous cutting.  
 4. The depth of cut in drilling is one-half of the feed.  
 Of these statements:  
 (a) 2, 3 and 4 are true                      (b) 1, 2 and 4 are true  
 (c) 1 and 2 are true                      (d) 3 and 4 are true (2.5 Marks)
- f) Which of the statements is most correct?  
 a) reamers are used to finish holes with accuracies not possible when a normal drill is used.  
 b) adjustable taps will cut a wide variety of threaded holes.  
 c) taps and reamers can both be used without a machine tool.  
 d) none of the above. (2.5 Marks)

**Problem number (2) (25 Marks)**

- a) Why we using reamer? (5 Marks)
- b) In a mild steel block, a flat surface of length 100 mm and width 60 mm has to be finished in a shaping machine in a single pass. How much machining time will be required if  $N_s = 80$ ,  $s_o = 0.2$  mm/stroke,  $A = O = 5$  mm,  $Q = 0.6$ . (7 Marks)
- c) Write short notes on: the different ways to make a taper on lathe machine? (5 Marks)
- d) A Determine the time that will be required to drill a blind hole of diameter 25 mm and depth 40 mm in a mild steel solid block by a HSS drill of  $118^\circ$  cone angle. Values of  $V_c = 25$  m/min and  $s_o = 0.16$  mm/rev. (8 Marks)

**Problem number (3) (25 Marks)**

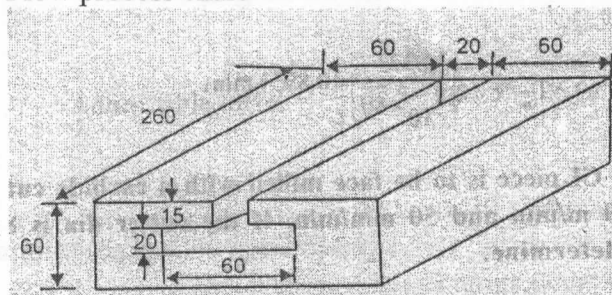
- a) What is the difference between boring and reaming? (5 Marks)
- b) Write short notes on: different types of gears making? (5 Marks)
- c) Compute total machining time ( machining time non-productive time) T-slot is to be cut in a C.I slab as shown in Fig. Estimate the machining time. Take cutting speed 25 m/min, feed is 0.25 mm/rev. Diameter of cutter for channel milling is 80 mm. (15 Marks)

Op No.	Operation Description	Sketch of Operation	Cutting Tools	Jigs and Fixture	Cutting Condition				M/C time min.
					Feed mm/rev	Speed m/min	Depth mm	No. of cut	

Process sheet

No.	OPERATION DESCRIPTION	QTY.	TIME (MINS.)	SYMBOL					REMARKS	
				○	◇	□	▣	▽		
1										
2										

Flow process chart



**Problem number (4) (20 Marks)**

- a) Write short notes on: Grinding Wheel, Types of Grinding, Components of a Wheel, Bonded abrasive and Grains? (2.5 Marks)
- b) Explain in detail how to mount the grinding wheel? (2.5 Marks)
- c) A shaft of st 42, 40  $\phi$ , 400 mm long is to be ground. It is supplied with a grinding size of 40.3  $\phi$ . Calculate the machining time where grinding wheel is 40 mm wide, feed per cycle 20 mm. No. of cuts=15. (5 Marks)
- d) The available index plate hole circles are as follows:  
 Plate 1: 15, 16, 17, 18, 19, 20  
 Plate 2: 21, 23, 27, 29, 31, 33  
 Plate 3: 37, 39, 41, 43, 47, 49  
 Calculate indexing for 24°30'  
 Calculate the indexing and change gears required for 57 divisions. The change gears supplied with the dividing head are as follows:  
 24, 24, 28, 32, 40, 44, 48, 56, 64, 72, 86 (10 Marks)





Course Title: Automatic Control  
Date: 21- 06 - 2014

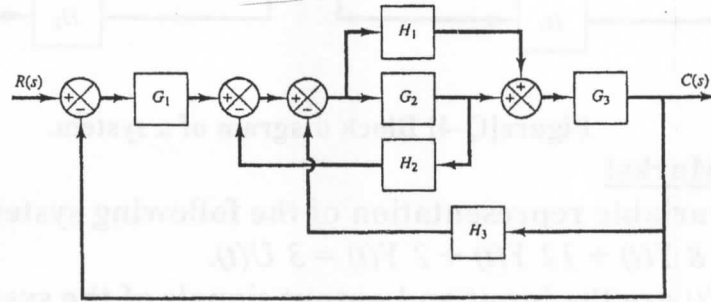
Course Code: MPD3223  
Allowed time: 3 Hrs

Year: 3<sup>th</sup> Prod. Eng.Dept  
No. of Pages: (1)

Answer All The Following Questions:-

**Question (1):- [15 Marks]**

Simplify the block diagram shown in the following figure and obtain the closed-loop transfer function  $C(s) / R(s)$ .



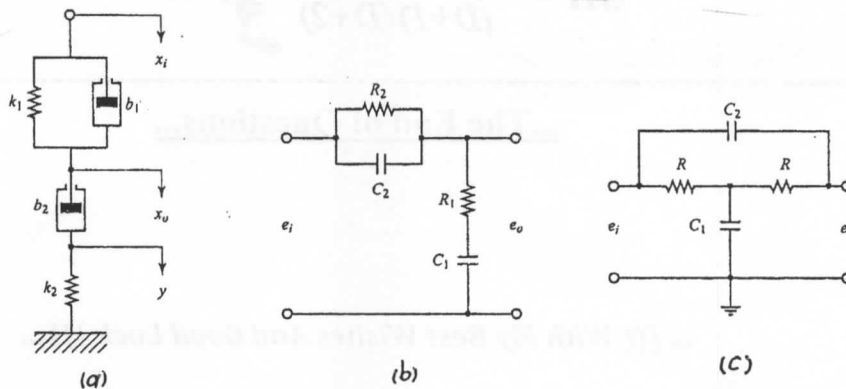
Figure[Q.1] Block diagram of a system.

**Question (2):[15 Marks = 8+7]**

i- If the characteristic equation of a closed-loop control system is in the form:-  
 $D^6 + 6D^5 + 37D^4 + 72D^3 + 327D^2 + 162D + 675 = 0$

Determine the stability condition of this system by the use of Routh stability method.

ii-Obtain the transfer functions  $X_o(s) / X_i(s)$  of (a) and  $E_o(s) / E_i(s)$  of the bridged T networks shown the following figures (b) and (c).



Figure[Q.2] (a) Mechanical system and Bridged T Networks.

**Question (3):[10 Marks]**

Use the block diagram of the control system shown in the following figure to find out the value of the controller gain (K) which makes the given system critically stable.

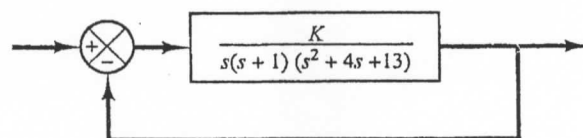
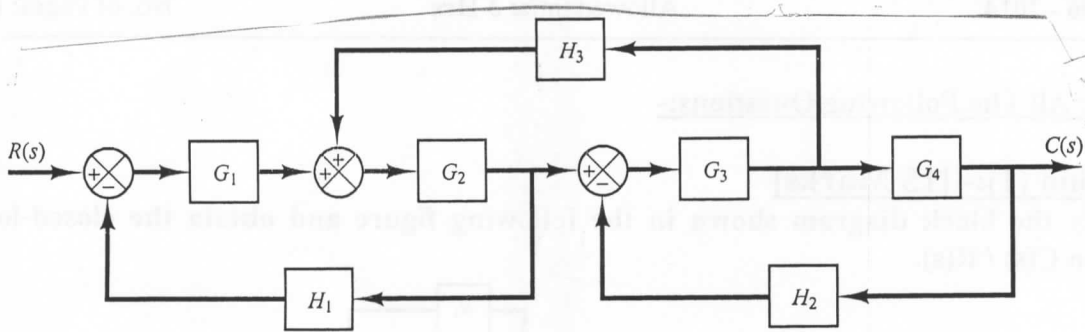


Fig.[Q. 3] Closed-loop Control System..

**Question (4):[15 Mark]**

Using Mason's formula, find the overall transfer function of the control system shown in the following figure of block diagram.



Figure[Q-4] Block diagram of a system.

**Question (5):[15 Marks]**

Obtain the state variable representation of the following system [Transfer Function]:-

$$\ddot{Y}(t) + 8 \dot{Y}(t) + 12 Y(t) + 2 Y(t) = 3 U(t).$$

where  $Y(t)$  and  $U(t)$  are the input and output signals of the system [ $\dot{Y}(0) = \ddot{Y}(0) = Y(0) = 0$ ]. Represent the resultant state variable model in the response form of time function?.

**Question (6):[15 Marks]**

Apply Nyquist criterion to a closed-loop control system if its open-loop transfer function is in the form:-

$$GH = \frac{10}{(D+1)(D+2)}$$

...The End of Questions...

... ((( With My Best Wishes And Good Luck ))) ...

[[[Examiner: Dr. Eng. Alaa A. El-Hammady]]]



Course Title: قوانين و تشريعات صناعية  
Date: 25 - 06 - 2014

Course Code: MPD32H4  
Allowed time: 2 Hrs

Year: 3<sup>rd</sup> Prod. Eng. Dept  
No. of Pages: (1)

أجب عن جميع الأسئلة التالية موضحا اجابتك كلما امكنك ذلك!!!

السؤال الأول:- ( ١٠ درجات = ٣+٣+٤ )

- أ- " للقانون مصادره التي يستمد منها أحكامه " ماهى هذه المصادر وبين ماهومادى وما هو شكلى و ما مزاياه؟. (٣)  
ب- بين كيف يتم تقسيم القاعدة القانونية من حيث مدى ما لها من قوة ملزمة؟. (٣)  
ج- " الأساس الذى يقوم عليه تصميم القاعدة القانونية هو وجود الدولة أو عدم وجودها فى العلاقة القانونية بصفتها صاحبة سلطان وسيادة " اشرح ذلك وعلل. (٤)

السؤال الثانى:- ( ١٠ درجات = ٣+٣+٤ )

- أ- تكلم عن القانون وفروعه وأقسامه ومدى أهميته فى مجالات العمل الاقتصادى عموما والهندسى خصوصا؟. (٣)  
ب- عرف كلا مما يلى:-  
القانون الطبيعى - الفقه - القضاء - القاعدة القانونية الامرة - التشريع - التبعية القانونية - التقاضى - العدل - الدعوى - الدين . (٣)  
ج-بين كيف يتم التمييز بين القاعدة القانونية وبين غيرها من القواعد الاجتماعية الأخرى؟ وماهى خصائص القاعدة القانونية؟. (٤)

السؤال الثالث:- ( ١٠ درجات = ٣+٣+٤ )

- أ- فرق بين العرف والعادة، وما هى الآثار المترتبة على التفرقة بين العرف والعادة؟.  
ب- ما هى الوظيفة الأساسية للقانون وما هو اساسه، وأذكر ماهى معايير التفرقة بين القانون العام والقانون الخاص؟.  
ج- ماهى القيود التى ترد على حرية العمل والقائمة على اعتبارات وطنية- وأذكر القيود الانسانية منها؟.

السؤال الرابع:- ( ١٠ درجات = ٢×٥ )

- أ- فى المنشآت غير الصناعية يكون للعامل الذى يثبت مرضه الحق فى الحصول على اجازة مرضية تصل الى .....يوما فى السنة، يمنح خلال ال.....يوما الأولى منها على.....% من أجره، أما ال.....يوما التالية فيحصل على.....% من أجره.  
ب- يجوز لصاحب العمل منح العامل الذى أمضى فى خدمته.....اجازة للحج أو ..... لمدة أقصاها..... يمنح خلالها .....من الأجر وتكون ..... طوال مدة خدمة العمل.  
ج- فى المنشآت التى تستخدم .....عاملا فأكثر يكون للعاملة الحق فى الحصول على اجازة بدون أجر لرعاية طفلها لمدة ..... ، وتمنح لها هذه الاجازة .....طوال مدة خدمتها.  
د- لصاحب العمل الحق فصل العامل اذا تغيب عن العمل بدون مبرر مشروع أكثر من .....يوما متقطعة خلال السنة الواحدة، أو أكثر من ..... أيام ..... على أن يسبق الفصل انذار العامل كتابة بعد غيابه ..... أيام فى الحالة الأولى، و..... أيام فى الحالة الثانية.  
ذ- ما هى المراحل التمهيديّة التى تسبق ابرام عقد العمل وما هى الأحكام الخاصة بالتوظيف والتخديم؟.

"انتهت الأسئلة"

مع اجمل التمنيات بالنجاح والتوفيق.....