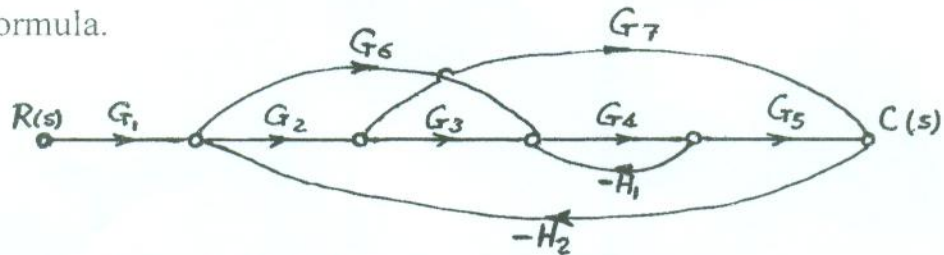**Figure[Q(3)]:** Closed-loop control system.

Question (4) :-

(a) **Discuss** the stability of the following characteristic equations using Routh-Hurwitz rule:

(i) $S^3 + S^2 + 2S + 2 = 0.$

(ii) $S^5 + 2S^4 + 4S^3 + 8S^2 + 10S + 6 = 0.$

(b) For the signal flow graph shown, **obtain** the closed-loop transfer function C(s)/R(s) by Use of Mason's formula.
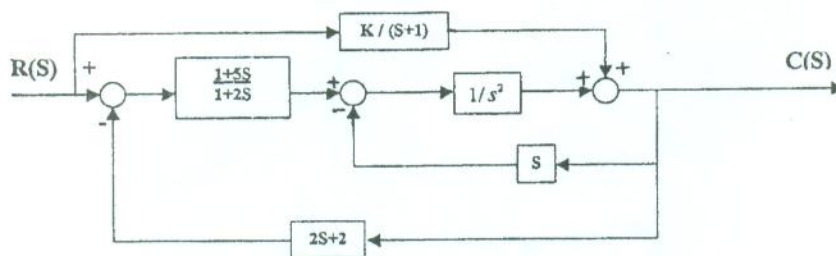

Figure[Q(4)-b]: Signal flow graph.

Question (5) :-

From the block diagram shown in Figure :-

(a) **Determine** the transfer function C(S) / R(S).

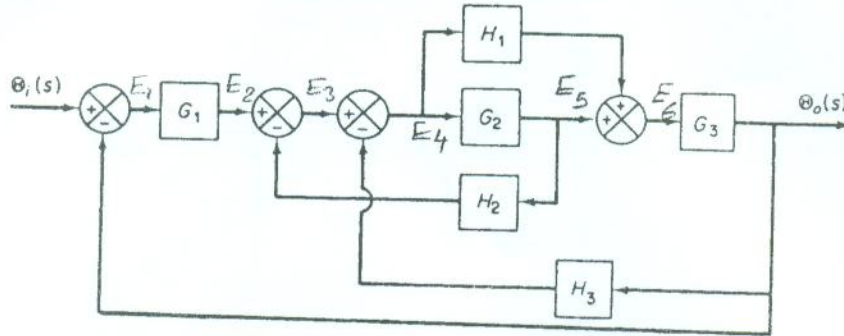(b) **Determine** the value (values) of (K) that the system to be stable ,and,

(c) For K = 10 , **find** the characteristic equation.

Figure[Q(5)]: The Block Diagram.

Question (6) :-

Use Mason`s Gain Formula to **find out** the overall transfer function of the control system shown in the following Figure.

Figure[Q(6)]: The Block Diagram.

With My Best Wishes

(3)

Tanta University	جامعــــــــة طنطا
Faculty of Engineering	كليــــة الهندســـــة
Department of Prod. Eng.&Mech. Desig	قسم هندسة الانتاج و التصميم الميكانيكى

|		
Department: Mech. Engineering	(2010-2011)	Date : 11 – 6 – 2011
Year : 3ᵗʰ Year		Time : 3 Hours
Exam : 2ⁿᵈSemester Exam.		Course Code : ME 303
Subject : Automatic Control Eng.		*Examiner :Dr.Eng.Alaa El.Hamm*ady

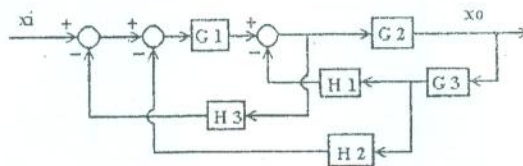**Attempt All Questions.**   **Number of Questions : 6**   **Number of Pages : 3**

Question (1) :-

(i) For the bridges-T network, prove that the relation between output voltage (V_0) and input voltage (V_i) have the following form:-
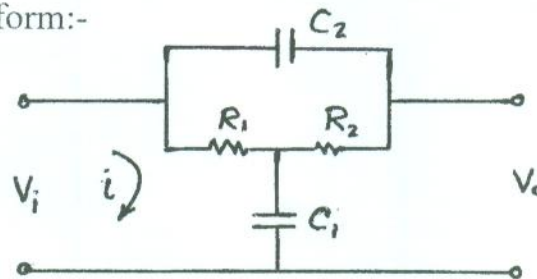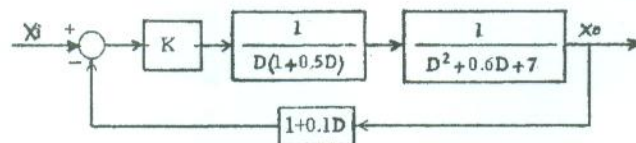

(ii) **Find** the transfer function for the following system :-

Figure[Q(1)i,ii]: Closed-loop control system.

Question (2) :-

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

**Figure[Q(2)]:** Closed-loop control system.

Question (3) :-

Use the block diagram of the control system shown in Figure to **find out** the value of the value of the controller gain (K) which makes the given system critically stable. State the stability condition of the given system if the value of the gain (K) is 300.

Question two (60%):

The gearbox shown in the figure below is used to transmit a power of 2kW between two shafts intersecting at 90°. The gearbox is composed of a straight tooth bevel pinion, which has 15 tooth, module of 4mm and is made of plain 0.4%C quenched and tempered steel, and a 60 tooth gear made of good grade cast iron. The pressure angle is 20°. The pinion speed is 15rev/s. Determine the safe face width for the bevel gear arrangement assuming uniform conditions of loading. Base calculations on strength only. (Precision gearing arrangement is required. High degree of reliability and infinite life are also required. A temperature factor of unity is also assumed)

All dimensions in mm

The sketch is not drawn to scale
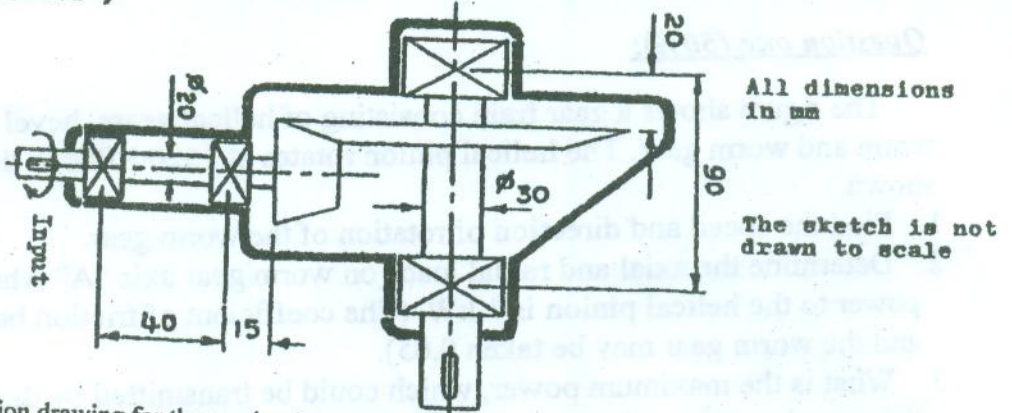
Draw a full construction drawing for the gearbox?
Select the type and the size of all bearings based on 1000 hr life?

TANTA UNIVERSITY

Machine Design
Time : 3 Hours

FACULTY OF ENGINEERING

3rd Year Mechanical Engineering
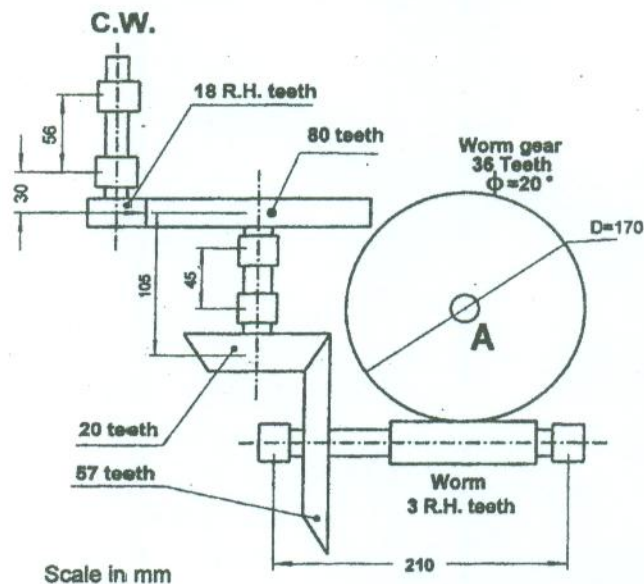
2010-2011

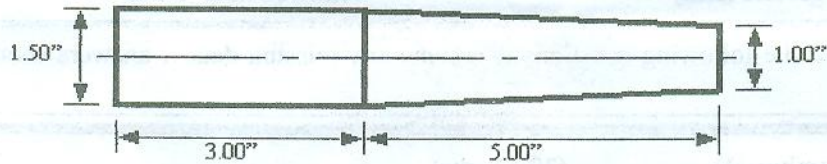## This Exam is an open book

Answer all questions.
Assume any missing data

Question one (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 pox and the maximum power.
5. Draw a free hand sketch for the worm shaft construction?

C.W.

18 R.H. teeth

80 teeth

Worm gear
36 Teeth
Φ=20°

D=170

A

20 teeth

57 teeth

Worm
3 R.H. teeth

210

Scale in mm

Problem number (3)   (25 Marks)

a)   Explain the different ways to make a taper on lathe machine?   (5 Marks)

b)   Compute total machining time (machining time non-productive time) for the workpiece 15 mm diameter and 32 mm length to produce the hollow hexagonal headed mild steel bolt (14 mm diameter, 30 mm length and thread M 10 X 2) as shown in Figure below, spindle speed for turning and drilling 640 rpm and 64 rpm for threading. Feed 0.10 mm/rev for rough and 0.05 mm/rev for fine operations (turning, facing, grooving, parting and chamfering). Velocity of cutting for milling is 30 m/min, feed 0.12 mm/tooth, an 8 teeth HSS mill cutter of 32 mm diameter. Using process sheet schema.   (20 Marks)
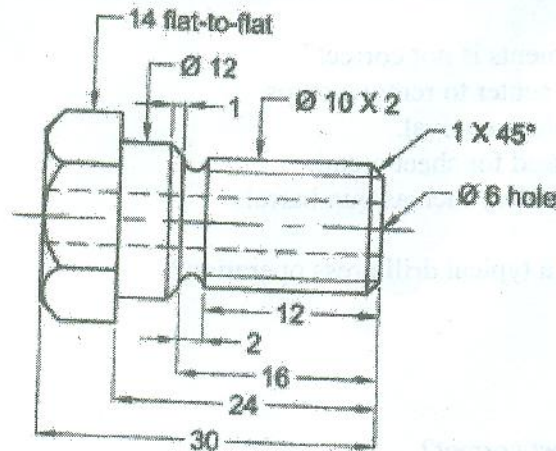
Problem number (4)   (20 Marks)

a)   Write the short notes on: Engine Lathe, Capstan lathe and Turret Lathe?   (5 Marks)

b)   Determine T_C for plain milling a rectangular surface of length 100 mm and width 50 mm by a helical fluted plain HSS milling cutter of diameter 60 mm, length 75 mm and 6 teeth. Assume A = O = 5 mm, V_C = 40 m/min and s_o = 0.1 mm/tooth.   (10 Marks)

c)   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 14°30'
Calculate the indexing and change gears required
for 101 divisions. The change gears supplied with
the dividing head are as follows:
     24, 24, 28, 32, 40, 44, 48, 56, 64, 72, 86

d)   Write short notes on: composition and structure of grinding wheel, wheel specification C-24-M-5-V, Basic types of grinding operations.   (5 marks)

Course Title: Machining Technology Date: Jan 14th 2011 (Second term)	Course Code: MPD3221 Allowed time: 3 hrs	Year: 3rd 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) Define, saws and draw of the basic saw blade?　　　　(2.5 Marks)

b) Classify the types of Saw operations; support your answer with neat sketches?　　　　(2.5 Marks)

c) What would happen if a drill without flutes was used?　　　　(2.5 Marks)

d) Which of these statements is not correct?
　　a) work is not moved on a radial arm drill press.
　　b) automatic feeds are available on sensitive drill presses.
　　c) multispindle drill presses must always drill multiple holes at once.
　　d) all of the above.　　　　(2.5 Marks)

e) Which of these statements is correct?
　　a) a margin of a drill bit does most of the cutting.
　　b) the relief angle on the tip of the drill bit makes it a conical shape.
　　c) a large drill bit point angle is useful for cutting soft materials.
　　d) none of the above.　　　　(2.5 Marks)

f) Which of the following statements is not correct?
　　a) core drills have a hollow center to remove chips.
　　b) high helix drills help in chip removal.
　　c) straight fluted drills are used for sheet metal.
　　d) centre drills are for long holes, such as gun barrels　　　　(2.5 Marks)

g) Which of the following is not a typical drill press operation?
　　a) counter boring.
　　b) spot facing.
　　c) counter sinking.
　　d) none of the above.　　　　(2.5 Marks)

h) 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) djustable 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) What are the main differences between planers and shapers?　　　　(5 Marks)

b) In shaping process it is required to remove a 4 mm thickness from a 200× 80 × 50 mm steel workpiece using average cutting speed of 60 m/min and 0.1 mm feed and 2mm depth of cut. Calculate:
i) Number of strokes per minutes (N);
ii) Number of strokes to finish the job (S);
iii) Time per stroke; and iv) Total time.　　　　(10 Marks)

c) What are functions of the following parts of a drill bit. a) body, b) web, c) point, d) tang, e) margin, f) flutes, g) body clearance.　　　　(5 Marks)

d) A taper is to be cut on the aluminium part below. Indicate how far the tailstock should be offset and the speed and feed settings for the lathe as shown in figure below.　　　　(5 Marks)
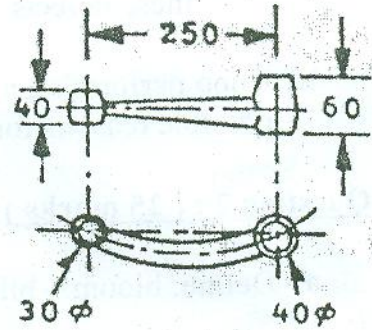
Question 3 : (25 marks)

a) Draw a wire drawing tool showing the main components of it.

b) Talk about the reasons for the breaking of the wire upon drawing.

c) A tank cover made of steel sheet of thickness "t" takes the shape of a hemisphere of diameter "D" is to be produced by explosive forming.
   i. Derive an expression to calculate the required deformation energy.
   ii. If the shell has a 2 m diameter and final thickness of 1.5 mm and the steel alloy has a hardening law of $\bar{\sigma} = 650\,\bar{\varphi}^{0.22}$ (MPa). The amount of energy per unit explosive mass is $4 * 10^7$ J/kg and the overall efficiency is 0.4 . What is the explosive mass necessary for the process?

Question 4 : (25 marks)

a) What are the main fields of application of extrusion process? Specify three different products manufactured by extrusion.

b) Explain with the aid of sketches the difference between the following forging processes:

   heading – fullering – edging

c) It is required to produce the shown connecting rod.
   i. Show with aid of neat sketches how the part is produced.
   ii. State the advantages of the method you choosed.

مع تمنياتى بالتوفيق و النجاح

Tanta University
Faculty of Engineering
Production Engineering & Design Dept.
3rd Year Prod. 2010/2011

Forming Technology
Saturday, 18.06.2011
Time allowed : 3 hours
Final Grade : 90 Marks

Final Exam

Solve all questions:

Question 1 : (25 marks)

a) It is required to produce the shown part in mass production from cold drawn steel of 150 MPa shear strength.

    i. Construct a suitable die-set to produce the part.

    ii. Calculate the required cutting force according to your die-set selection and the center of pressure due to the shearing process.

    iii. Show with neat sketches the possible defects in the part due to shearing and the methods to avoid these defects.

Dim. in mm   Sec A-A
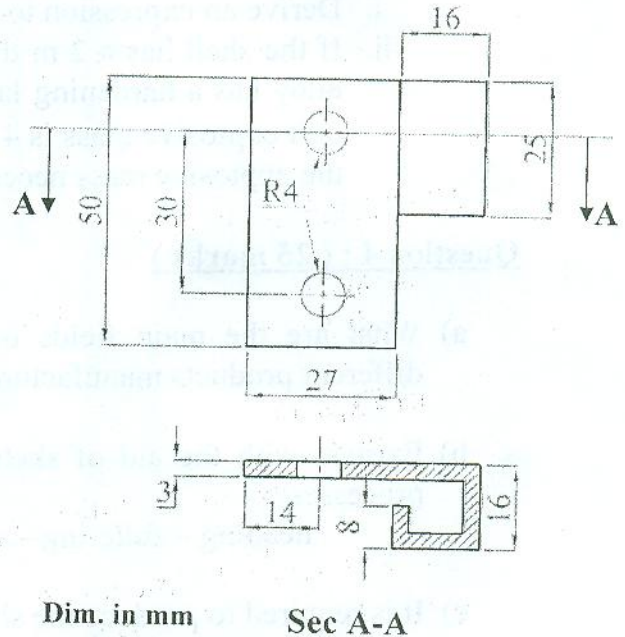
b) Upon performing a deep drawing process fracture is observed. What could be the possible reasons for that?

Question 2 : (25 marks)

a) Define: bloom – billet – slab – plate – sheet – strip

b) With the aid of sketches show the main types of rolling mills.

c) 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°. The material has a modulus of elasticity of 200 GPa and a yield stress of 250 MPa.

    i. Plot the change of the strain and stress along the contour.

    ii. Is it recommended to use the given rolling conditions? Justify your answer.

    iii. What are the actions to be done in order to have a successful rolling process.

جامعة طنطا

كلية الهندسة

قسم هندسة الإنتاج والتصميم الميكانيكي

المادة : قوانين وتشريعات

الفرقة : الثالثة إنتاج حديث

التاريخ : ٢٠١١/٦/٢٥

الزمن : ٢ ساعة

أجب علي الأسئلة التالية:

1- ما هو الفرق بين كلا من:
- العقود المدنية
- العقود التجارية
- العقود الإدارية

2- ماهي الشروط الواجب توافرها في المحل عند النص عليه في العقود المدنية , ومتي يكون محل الإلتزام باطلا؟

3- ماهي أنواع الأجر في المقاولة , وماهي الوثائق التي يجب أن تكون مصحوبة بعقد المقاولة؟

4- وضح الفرق بين العقد الرضائي والعقد الشكلي , والفرق بين العقد الفوري والعقد المستمر.

5- وضح العناصر الرئيسية التي يتكون منها تقرير الخبرة الفنية , وما هي أهم الشروط الواجب توفرها في المعاينة الفنية للخبير الفني؟

Question 3 : (25 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 cm^2 and operates on a pressure of 15 MPa.

c) One of the ram lifting mechanisms in hammers is belt and pressure roll. Explain how it works.

Question 4 : (25 marks)

a) The shown part is to be produced from a steel sheet of thickness 5 mm. It is required to produce the part from one stroke. the distance between the counter balances of the used press is 2 m. The die should be exactly centered on the press. What counter force should be provided to the avoid bending of the upper ram? Take the shear strength of the steel to be 200 MPa.
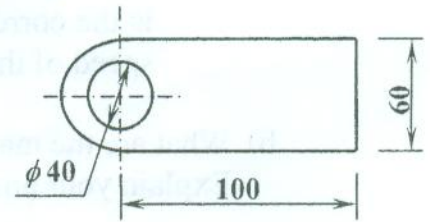
Dim. in cm

b) What are the functions of the main groups of the press electrical control systems?

c) Assign a suitable forming machine to produce the following products and justify your choice.

   i. coins
   ii. cranck shaft
   iii. car door
   iv. doors and windows aluminium sections
   v. Body of hand Extinguisher (جسم مطفأة حريق يدوية)

مع تمنياتى بالتوفيق و النجاح

Tanta University	Forming Machines
Faculty of Engineering	Tuesday, 21.06.2011
Production Engineering & Design Dept.	Time allowed : 3 hours
3$\underline{rd}$ Year Prod. 2010/2011	Final Grade : 90 Marks

Final Exam

Solve all questions:

Question 1 : (25 marks)

a) A press with crank drive has a maximum capacity of 200 kN at 30° above BDC .
Its maximum torque is 5 kN.m. .
- i. Plot the allowable load vs. the crank angle position, knowing that its stroke is 100 mm.
- ii. If the maximum load for a specific forming operation is 150 kN and occurs when the crank angle is 35° above BDC. Is this press suitable for this specific operation?
- iii. For a specific workpiece the punch contacts at 6.7 mm above (BDC). What is the corresponding angle α ? If the crank rotates with 100 rpm what is the speed of the ram at the point of contact?

b) What are the main specification of an eccentric press?
Explain your answer with the aid of sketches.

c) With the aid of schematic drawings show the difference between knuckle-lever press and toggle drive press.

Question 2 : (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.