جمهورية العراق
وزارة التعليم العالي و البحث العلمي
جامعة الفرات الأوسط التقنية
الكلية التقنية الهندسية / النجف

قسم هندسة تقنيات الطيران

المرحلة الثانية

أسئلة الفصل الأول للعام الدراسي

٢٠١٦-٢٠١٧

شعبة ضمان الجودة و الأداء الجامعي

قسم الطيران
ج/ب

Ministry of Higher Education & Scientific Research
Al-Furat Al-Awsat Technical University
Engineering Technical College- Najaf
Department of Aeronautical Eng. Tech.

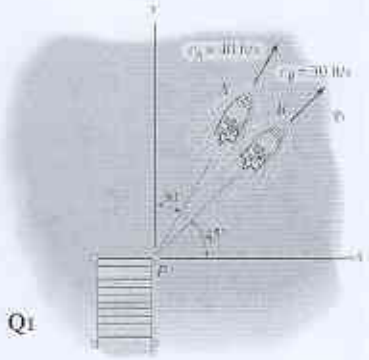
Class Level: 2nd year | Course Title: Dynamics
Instructor: Dr. Assaad Al-Sahlani | Mid-term 1 / 2016-2017 | Time: 2 hours

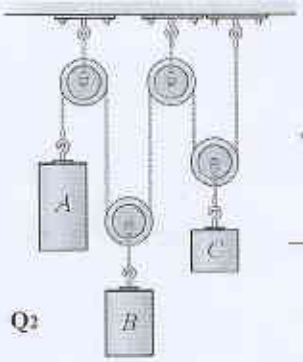
Note: All problems are evenly weighted, answer four only.

Q1: Two boats leave the pier **P** at the same time and travel in the directions shown. If $v_A = 40$ ft/s and $v_B = 30$ ft/s, determine the velocity of boat A relative to boat B. How long after leaving the pier will the boats be 1500 ft apart?

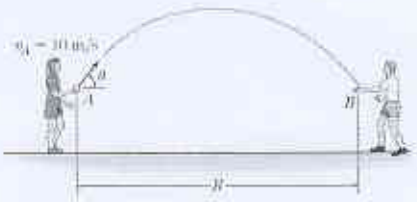
Q2: If block **A** of the pulley system is moving downward at 6 ft/s while block **C** is moving down at 18 ft/s, determine the relative velocity of block **B** with respect to **C**.

Q3: Show that the girl at **A** can throw the ball to the boy at **B** by launching it at equal angles measured up or down from a 45° inclination . If $v_A = 10$ m/s, determine the range **R** if this value is 15°, i.e., $\theta_1 = 45° - 15° = 30°$ and $\theta_2 = 45° + 15° = 60°$. Assume the ball is caught at the same elevation from which it is thrown.

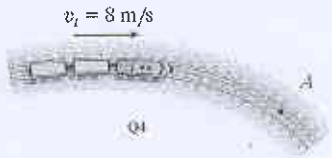

Q1



Q2

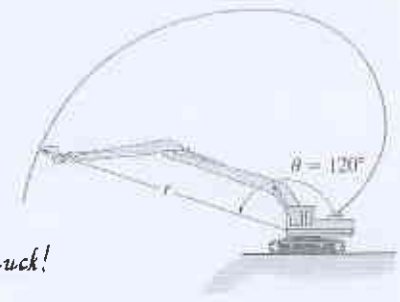

Q3

Q4: When $t = 0$, the train has a speed of 8 m/s, and the velocity is given as $v = 0.5t + 8$. Determine the magnitude of the acceleration of the engine when it reaches point **A**, at $t = 20$ s. Here the radius of curvature of the tracks is $\rho = 400$ m.



Q4

Q5: For a short time the bucket of the backhoe traces the path of the cardioid $r = 25(1 - \cos\theta)$ ft. Determine the magnitudes of the velocity and acceleration of the bucket when $\theta = 120°$, if the boom is rotating with an angular velocity of $\dot{\theta} = 2$ rad/s and an angular acceleration of $\ddot{\theta} = 2$ rad/s^2 at the instant shown.



Q5

Good Luck!

Cordially !

Head of Dept.
Dr. Assaad Al Sahlani

قسم الطيران
ط/ ٢

stry of Higher Education and
Scientific Research
Al-Furat Al-Awsat Technical
University
Najaf Technical Engineering
College

Department: Aeronautical Technical Engineering
Class: Second
Subject: Thermodynamics
Time: 2 hours
Date: 18/01/2017

First course exam (first attempt) 2016- 2017

Note: 1) Answer all the questions

2)Allow using tables

Q1/ Steam is the working fluid in an ideal Rankine cycle. Saturated vapor enters the turbine at 8.0MPa and saturated liquid exits the condenser at a pressure of 0.008 MPa. The *net* power output of the cycle is 100 MW. Determine for the cycle **(a)** the thermal efficiency, **(b)** the back work ratio, **(c)**The mass flow rate of the steam, in kg/h, **(d)** the rate of heat transfer into the working fluid as it passes through the boiler, in MW, **(e)** the rate of heat transfer, from the condensing steam as it passes through the condenser, in MW. ***(30M)***

Q2/ *Answer* ***FIVE*** *only.* ***(15M)***

1) A system undergoes a process between two fixed states first in a reversible manner and then in an irreversible manner. For which case is the entropy change greater? Why?

2) Is it possible to create entropy? Is it possible to destroy it?

3) Does a cycle for which $\oint \delta Q > 0$ violate the Clausius inequality? Why?

4) When is the flow through a control volume steady?

5) What is flow energy? Do fluids at rest possess any flow energy?

6) Define the coefficient of performance of a heat pump in words. Can it be greater than unity?

7) Compare two domestic heat pumps (A and B) running with the same work input. If A is better than B, which one provides more heat?

Q3/ A tank having a volume of (0.85 m^3) initially contains water as a two-phase liquid—vapor mixture at (260°C) and a quality of (0.7). Saturated water vapor at (260°C) is slowly withdrawn through a pressure-regulating valve at the top of the tank as energy is transferred by heat to maintain the pressure constant in the tank. This continues until the tank is filled with saturated vapor at (260°C). Determine the amount of heat transfer, in kJ. Neglect all kinetic and potential energy effects. ***(30M)***

Q4/ A mass of 1 kg of air contained in a cylinder at 1.5 MPa, 1000 K expands in a reversible isothermal process to a volume 10 times larger. Calculate the heat transfer during the process and the change of entropy of the air. ***(25M)***

Examiner

Basil Noori Merzha

Head of department

Dr. Assaad Al-sahlani

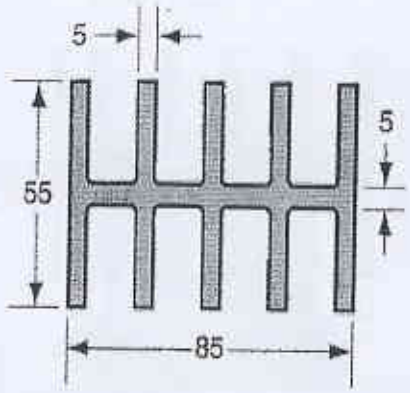
جمهورية العراق
وزارة التعليم العالي والبحث العلمي
هيئة التعليم التقني
جامعة الفرات الأوسط التقنية
الكلية التقنية الهندسية / نجف

القسم : هندسة تقنيات الطيران
المرحلة : الثانيه
المادة: عمليات تصنيع
زمن الامتحان:2 ساعة
التاريخ: / /2017

امتحان الفصل الاول- العام الدراسي 2017/2016

ملاحظة: الإجابة عن جميع الأسئلة

Q1/A/ A direct extrusion operation produces the cross section shown in Figure below(d) from an aluminum billet whose diameter = 150 mm and length = 900 mm. The flow curve parameters for the aluminum are $K = 240$ MPa and $n = 0.16$. In the Johnson strain equation, $a = 0.8$ and $b = 1.5$. Determine (a) the extrusion ratio, (b) the shape factor, (c) the force required to drive the ram forward during extrusion at the point in the process when the billet length remaining in the container = 850 mm, and (d) the length of the extruded section at the end of the operation if the volume of the butt left in the container is 600,000 mm^3. **[15M]**



Q1/B/ Mention with drawing the step of shrinkage of a cylindrical casting during solidification and cooling. **[10M]**

Q2/A/ A continuous hot rolling mill has two stands. Thickness of the starting plate = 25 mm and width = 300 mm. Final thickness is to be 13 mm. Roll radius at each stand = 250 mm. Rotational speed at the first stand = 20 rev/min. Equal drafts of 6 mm are to be taken at each stand. The plate is wide enough relative to its thickness that no increase in width occurs. Under the assumption that the forward slip is equal at each stand, determine (a) speed v_r at each stand, and (b) forward slip s. (c) Also, determine the exiting speeds at each rolling stand, if the entering speed at the first stand = 26 m/min. **[15M]**

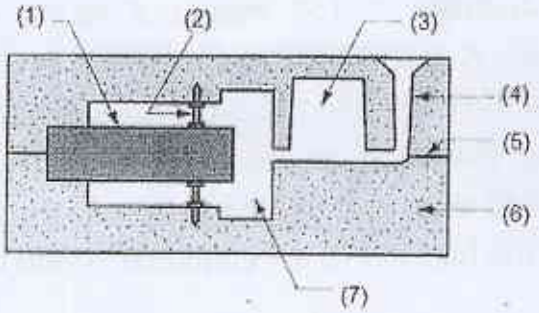
Q2/B/ Explain The basic oxygen furnace with drawing the BOF sequence during processing cycle? **[10M]**

Q3 / A/ Explain with drawing the blast furnace and mention the most important reaction? **[20 M]**

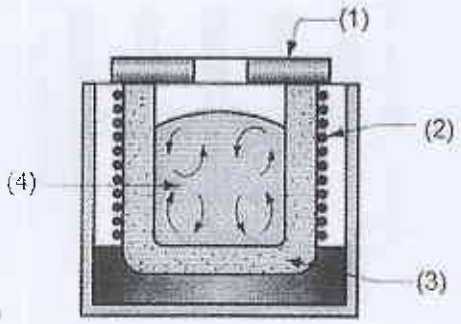
Q3 / B/ A hot upset forging operation is performed in an open die. The initial size of the work part is: $D_o = 25$ mm, and $h_o = 50$ mm. The part is upset to a diameter = 50 mm. The work metal at this elevated temperature yields at 85 MPa ($n = 0$). Coefficient of friction at the die-work interface = 0.40. Determine (a) final height of the part, and (b) maximum force in the operation. **[5M]**

Q4/A/ Point to the drawing details illustrated below: **[15M]**

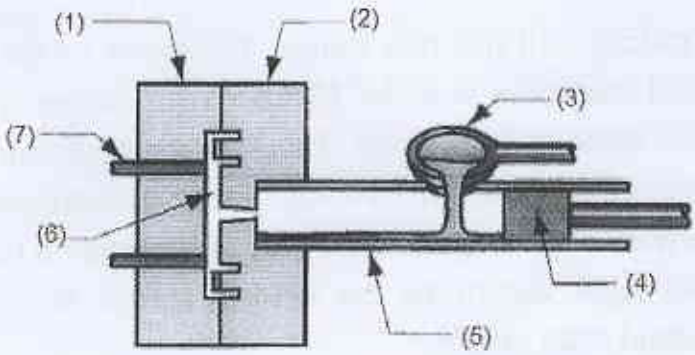
1. Sand casting mold.



2. Induction furnace



3. Cold chamber casting



Q4/B/ Wire stock of initial diameter = 0.125 in is drawn through two dies each providing a 0.20 area reduction. The starting metal has a strength coefficient = 40,000 lb/in^2 and a strain hardening exponent = 0.15. Each die has an entrance angle of 12°, and the coefficient of friction at the work-die interface is estimated to be 0.10. The motors driving the capstans at the die exits can each deliver 1.50 hp at 90% efficiency. Determine the maximum possible speed of the wire as it exits the second die. **[10M]**

Good Luck

رئيس القسم
د. اسعد السهلاني

مدرس المادة
م.م. أضواء محمد النصراوي

Al-Furat Al-Awsat Technical University
Aeronautical Technical Engineering Department
Subject/ Programming
Class/ Second
Time/ 2 hours

1st Term Exam 2016-2017

Q1/ Answer **five** of the following:-

Create matrix as

$$c = \begin{bmatrix} 3 & 7 & 6 & 4 \\ 2 & 4 & 1 & 3 \end{bmatrix}$$

1- replace the first number with 15
2- add third row equal to {6,12,8,4}
3- find the matrix determinant
4- delete the even column of matrix c
5- find transpose of matrix c
6- find matrix dimension

Q2/ Write a program in GUI to enter two numbers and find (sum , subtract, multiply) by using check box

Q3/ Answer **one** of the following:-

a- Write a program in MATLAB to enter any number and check it, if it is odd find factorial and if even find square of the number.

b- write a program using GUI to enter three function (sine(t) ,cosine(t), exponential(t)) using pop-up menu and draw the function select in axes?

Q4/ plot the functions

1- X1=3+6 cos(t) in first location with color is yellow
2- y1=-2+9 sin(t) in second location with color is blue
3- x2=7+2 cos(t) in third location with color is green
4- y2= 8+6 sin(t) in fourth location with color is black

In the interval $0 \leq t \leq 2\pi$ and step is $(\pi/10)$

use the subplot command to display **Two dimension Graphics** to these functions on four windows on the same graph.

.....

Good Luck

Lecture

Rusul Sabah

Head of Dept

Dr. Assaad Al Sahlani

قسم الطيران
ب/ح

Ministry of Higher Education
& Scientific Research
Al-Furat Al-Awsat Technical University
Najaf Engineering Technical College

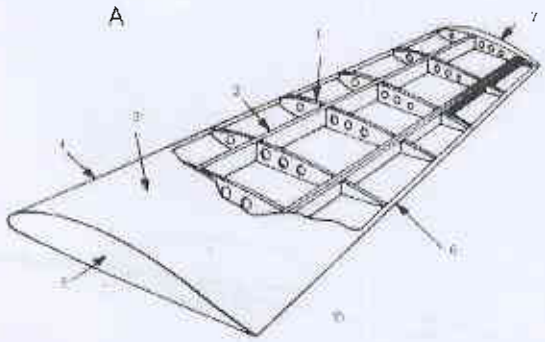
Aeronautical Engineering
Technical Department
Mid Exam 2016/2017

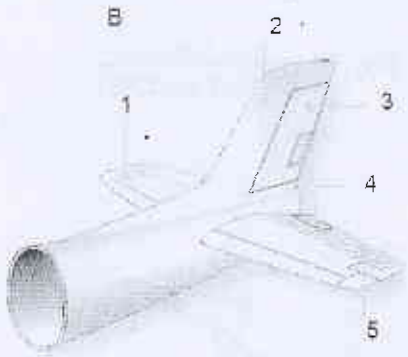
Subject: Theory of Flight
Time: 2 hours
Class level: 2nd Stage

Q1: An aircraft has a wing area of (S=20m2) the aircraft travel's with Mach number (M1=1.2) at an altitude of (10 km) with lift coefficient of (CL=0.8), suddenly the aircraft face a snow storm, then the pilot decided to increase elevation of aircraft to an altitude of (12.5 km) by raise the lift coefficient to maximum value (CLmax=1.15), but keep the same speed (V2=V1). Determine the following:-

1- Speed of aircraft in km/hr. and Mach number at (**12.5 km**).
2- Lift force at (**10 km**) altitude.
3- Lift force at (**12.5 km**) altitude

Q2: Give the names of the following items: (25 M)





Q3: A- For the secondary/Auxiliary flight control surfaces, specify the location and function of the following items: Flaps, Spoilers, Slats, Slots and aileron. (15 M)

B- Sketch the aircraft wing profile and give the name for the primary contents. (5 M)

C- What is the relationship between an angle of attack and a lift/drag forces for plain airfoil? Graph it.

(5 M)

Q4: Small airplane flying at sea level (holding flight) at (L/D)max. The thrust required to perform such flight is (T=2000 N). The elliptical loading wing area is (S=20 m2), zero lift drag coefficient is (CDo= 0.02) and aspect ratio is (AR=4). Determine the airplane weight.

Relations

$$P_H = P_o * \left(1 - \frac{H}{44300}\right)^{5.256} \quad for\ H < 11000\ m$$

$$P_H = 22650 * e^{(1.73 - 0.000157H)} \quad for\ 11000 < H < 25000\ m$$

$$P_H = 2488 * \left(\frac{141.89 + 0.00299H}{216.6}\right)^{-11.388} \quad for\ H > 25000\ m$$

$$T_H = T_o - (0.00649 * H) \quad , \quad For\ H < 11000\ m$$

$$\rho_H = \frac{P_H}{287 * (T_H + 273)}$$

Lecturer
Assist. Prof. Dr. Ali Sh. Baqir

Aeronautical Eng. dept. Head
Dr. Assad Awad

قسم الطيران
ط/ج

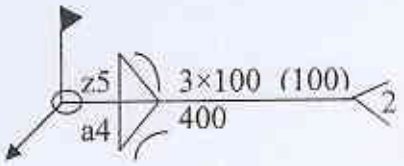
بسمه تعالى

Ministry of Higher Education and Scientific Research
Al-Forat Al-Awsat Technical University
Najaf Technical Engineering College
Dept. of Aeronautical Technical Engineering

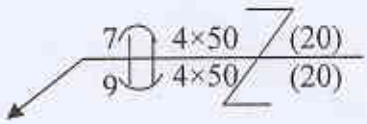
Subject: Mechanical Drawing
Class: 2nd year
Time: 2 hour
Date: / 1 /2017
Instructor: Noor Hussein

First Course Examination 2016- 2017

A/Q1: فسر رموز اللحام أدناه. 20 Marks



(b)

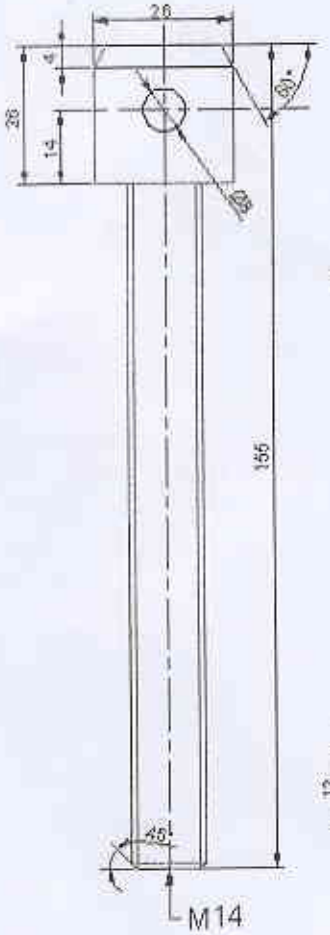


(a)

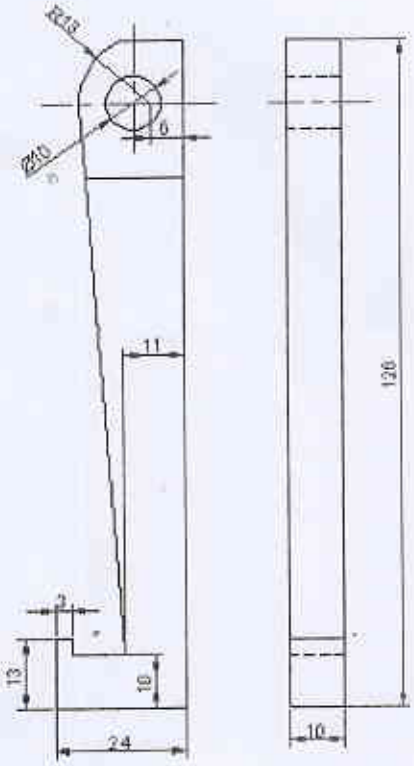
B: أين يستخدم الخابور؟ وما نوع الإجهاد الذي يتعرض له؟ 10 Marks

A/2Q: ارسم المسقط الأمامي نصف مقطوع للشكل المجمع من الأجزاء الموضحة في أدناه. 60 Marks

B: رتب جدول للأجزاء المستخدمة في عملية التجميع مع بيان أعدادها ومعادنها. 10 Marks

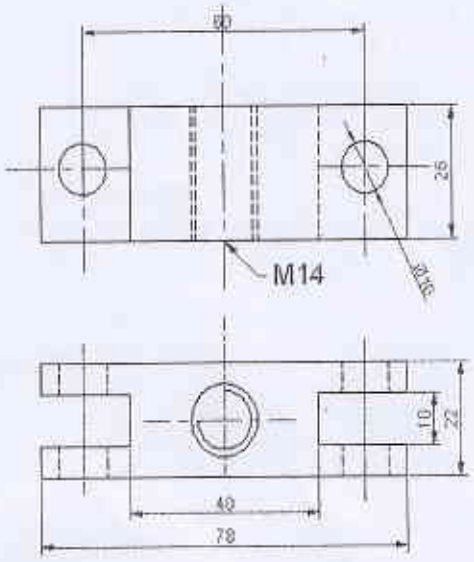


4- برغي سحب

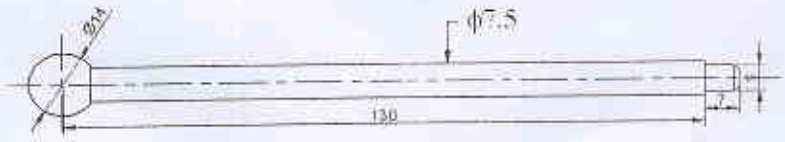


2 - فك, عدد 2

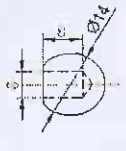
3- مسمار



رباط-1



مقبض -5



كرة -6

Head of Department
Dr. Assad AL-Sahlany

Good Luck

قسم الطيران
٢/ب

Ministry of Higher Education and Scientific Research
Al-Furat Al-Awsat Technical University
Tech. Eng. College – Najaf/Aeronautical Tech. Eng. Dept.
semester examination 2016-2017 First

Subject: Fluid Class: 2st year
Time: 2 hours Date: / / 2017

Notes// 1. Please read the questions carefully, 2. Answer all question

Q1:a) Determine the mass of air in a $2m^3$ tank if the air is at room temperature, 20 °C, and the absolute pressure within the tank is 200 kPa. **(10 Degree)**

Q1:b) Determine the speed of sound at 20 °C in (a) air, (b) helium and (c) natural gas. Express your answer in m/s. **(15 Degree)**

Fluid	K (ratio of specific heats) (-)	R (gas constant) J/Kg.K
air	1.4	286.9
helium	1.66	2077
natural gas	1.31	518.3

Q2:a) A closed, 5m-tall tank as shown in Figure 2 is filled with water to a depth of 4 m. The top portion of the tank is filled with air which, as indicated by a pressure gage at the top of the tank, is at a pressure of 20 kPa. Determine the pressure that the water exerts on the bottom of the tank. Also calculate the pressure at point 1 and 2.

(25 Degree)

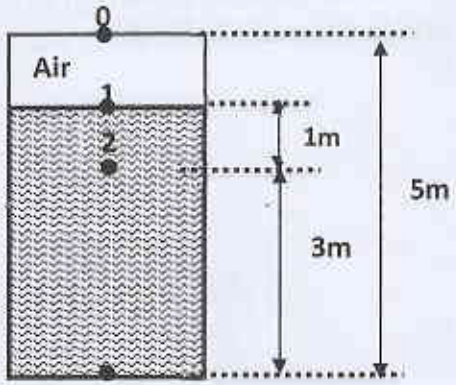


Figure 2

Ministry of Higher Education and Scientific Research
Al-Furat Al-Awsat Technical University
Tech. Eng. College – Najaf/Aeronautical Tech. Eng. Dept.
semester examination 2016-2017

First

Subject: Fluid
Time: 2 hours

Class: 2st year
Date: / / 2017

Notes// 1. Please read the questions carefully, 2. Answer all question

Q3: The 4-m-diameter circular gate of Figure 3 is located in the inclined wall of a large reservoir containing water The gate is mounted on a shaft along its horizontal diameter, and the water depth is 10 m above the shaft. **(25 Degree)**

$$I_{xc} = \frac{\pi R^4}{4}$$

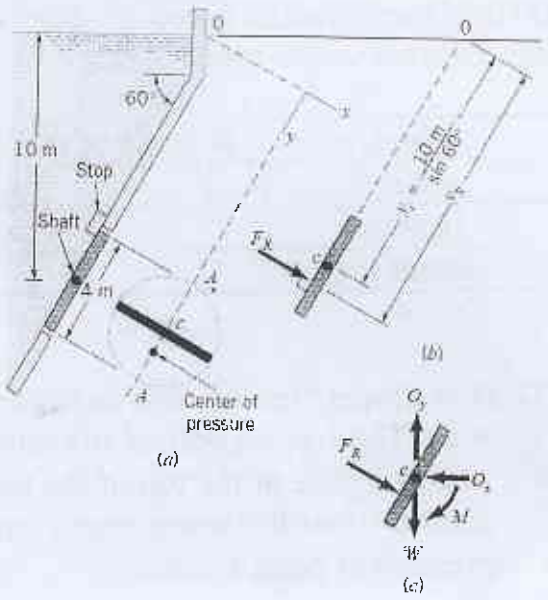


Figure 3

Q4: Water flows through the pipe contraction shown in Figure 4. For the given O.2-m difference in manometer level, determine the flow rate (Q) as a function of the diameter of the small pipe, **D**. **(25 Degree)**

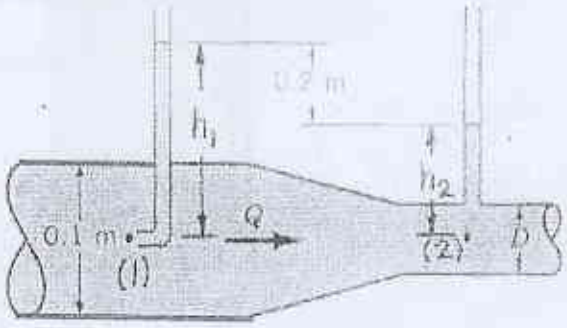


Figure 4

Dr. Eng. Mahdi Hatf Kadhum
The Examiner

Dr. Assaad Al Sahlani
Head of Depart.

قسم الطيران
ج / ب

ATU University
Technical College Engineering - Annajaf

Dep. : Acronautical Eng. Techniques.
Grade Level: 2nd.
Object: Strength of Materials.
Exam Time: 2 hours.

****

Note: Endeavor All Questions

Group (A): Mechanics of Materials Conceptions (20 Marks)

Q1: Briefly representing the following cases conceptions: (10 Marks)

(1) Study the solid body section in mechanic systems.

(2) Normal and tangent cross sectional area.

(3) Failure shear stress and allowable shear stress relation.

(4) Supply angle with shear stress element.

(5) Lateral deformation to longitudinal deformation.

Q2: Based on Saint-Venant's principle, derivative the segment deflection. (10 Marks)

Group (B): Mechanics of Materials Problems (80 Marks)

Q1: The assembly consists of three disks A, B, and C in the figure (1) that are used to support the load of 140 kN. Determine the smallest diameter (d_1) of the top disk, the diameter (d_2) within the support space, and the diameter (d_3) of the hole in the bottom disk. The allowable stress for the material is $\sigma_{allow} = 350$ MPa and allowable shear stress is $\tau_{allow} = 125$ MPa.

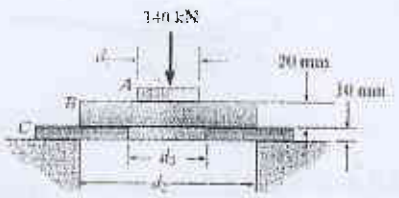


Figure (1) Three disks assembly

(30 Marks)

Q2: The state of stresses is referring to in figure (2) on the element. Determine (a) the principal stress and (b) the maximum in-plane shear stress and average normal stress at the point (c) the orientation of the element in each case. Sketch the results on each element. (30 Marks)

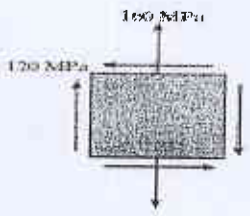


Figure (2) Rotating element

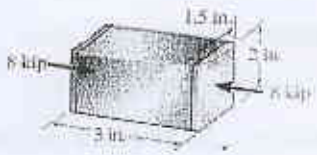
ATU University
Technical College Engineering - Annajaf

Dep. : Aeronautical Eng. Techniques.
Grade Level: 2nd.
Object: Strength of Materials.
Exam Time: 2 hours.

****

Q3: The Aluminum block in figure (3) has a rectangular cross section and is subjected to an axial compressive force of 8 kip. If the (1.5 in) side changed its length to (1.500132 in.), determine Poisson's ratio and the new length of the (2 in) side. Take the Young's modules elasticity of Aluminum block is ($E_{Al} = 10 \times 10^3$) ksi. (20 Marks)

Figure (3) Aluminum block



GOOD LUCK

Examiner	Examiner	Head of Aeronautical Dep.
A.Lecturer: Mohammed A. Abass	A.Lecture: Haider Hashim	Dr. Assaad A. Abbas