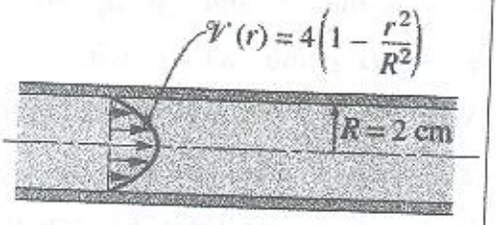
Tanta University Faculty of Engineering Mech. Production. Dept.	Final Exam Max. Mark 75 Fluid Mechanics(MEP2150)	Time allowed 3 hr 14 Jan 2009 Second Year

Question:1 [15]

A. The velocity profile in fully developed laminar flow in a circular pipe of inner radius R =2 cm, in m/s, is given by: $V(r)= 4(1- r^2/R^2)$.

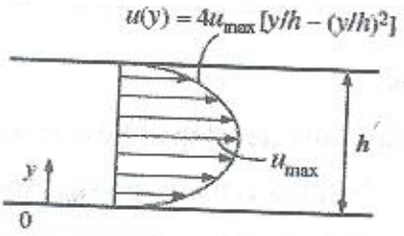
Determine the mean and maximum velocities in the pipe, and the volume flow rate



B. Consider the flow of oil with ρ=894 kg/m^3 and μ=2.33 kg/ms in a 40 cm diameter, 300 m long pipeline at an average velocity of 0.5 m/s. Disregarding the entrance effects, determine the pumping power required to overcome the pressure losses and to maintain the flow of oil in the pipe.

Question:2 [15]

A. Consider one dimensional laminar flow of a Newtonian fluid of viscosity μ between two parallel plates. The velocity profile is given as: $\mathbf{u(y)=4u_{max}[y/h-(y/h)^2]}$, where y is the vertical coordinate from the bottom surface, h is the distance between the two plates, and $\mathbf{u_{max}}$ is the maximum flow velocity that occurs at midplane. Develop a relation for the wall shear stress and drag force exerted on both plates by the fluid in the flow direction per unit area of the plates.



B. A tank contains water of density 1000 kg/m^3 up to a height of 3 m above the base. An immiscible liquid of specific gravity 0.8 is filled on top of that over 2 m depth. Calculate the pressure at a point 1.5 m below the free surface, at the interface and at another point 2.5 m below the free surface. Calculate also the force on a vertical wall, 6 m wide.

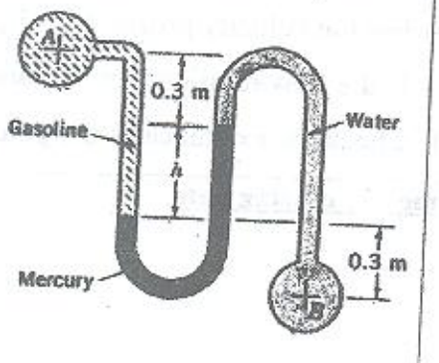
Question:3 [15]

A. What is forced flow? How does it differ from natural flow? Is flow caused by wind forced or natural flow?

B. What are the three major assumptions used in derivation of the Bernoulli equation? Express the Bernoulli equation in three different ways using

a-energies b-pressures c-heads.

C. The differential mercury manometer is connected to pipe A containing gasoline (SG = 0.65) and to pipe B containing water. Determine the differential reading h corresponding to a pressure in A of 20 kPa and a vacuum of 150 mm Hg in B.



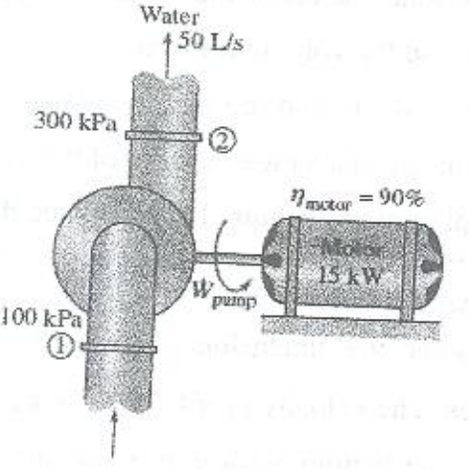
Turn Over

Question:4 [15]

A. How is the combined pump-motor efficiency of a pump and motor system defined? Can the combined pump-motor efficiency be greater than either the pump or the motor efficiency?

B. What is pump head? How is it related to the power input to the pump?

C. The pump of a water distribution system is powered by a 15-kW electric motor whose efficiency is 90 percent The water flow rate through the pump is 50 L/s. The diameters of the inlet and outlet pipes are the same, and the elevation difference across the pump is negligible. If the pressures at the inlet and outlet of the pump are measured to be 100 kPa and 300 kPa (absolute), respectively, determine (a) the mechanical efficiency of the pump and (b) the temperature rise of water as it flows through the pump due to the mechanical inefficiency..



Question:5 [15]

A. Consider fully developed flow in a circular pipe with negligible entrance effects:

i) Will the velocity profile change in the flow direction?

ii) If the length of the pipe is doubled, how will the head loss change?

iii) If the diameter of the pipe is reduced by half while the flow rate and the pipe length are held constant, how will the head loss change?

iv) If the viscosity of the fluid is reduced by half by heating while the flow rate is held constant, how will the head loss change?

B.

i) Given the eulerian velocity-vector field: $V = 3ti + xzj + ty^2k$ find the acceleration of a particle.

ii) An incompressible velocity field is given by: $u = a(x^2 - y^2)$, $v = ?$, $w = b$ where a and b are constants. What must the form of the velocity component v be?

iii) For the velocity profile as in ii, b=0, find the stream function

iv) Is the flow rotational or irrotational?

v) Check the existence of the potential function, find it if it exists.

Assume any missing data.

Good Luck.

Dr Gamal Bedair

Tanta, Jan. 2009

جامعة طنطا
كلية الهندسة
قسم هندسة الإنتاج والتصميم الميكانيكي

المادة/ اقتصاد هندسى
(MPD21H3)
الفرقة الثانية (لائحة جديدة)

بسم الله الرحمن الرحيم
التاريخ : 2009 /1/17
الزمن : ساعتان

أجب عن الأسئلة الآتية:- (40 درجة)

السؤال الأول:-

- " هناك العديد من انواع التكاليف تستخدم فى الاقتصاد الهندسى عند تحليل الجدوى المالية للمشروعات الصناعية" تكلم بالتفصيل عن انواع التكاليف.
- تكلم عن اهم الخطوات الرئيسية للدراسة الاقتصادية .
- اشرح بالتفصيل العناصر الاساسية لتصنيع منتج ما.

السؤال الثانى:-

1- اكتب نبذة متصرة عن:-
التكاليف - سياسة الاحتكار - المنفعة الكلية والحدية

2- ما هى العوامل التى تؤثر على الطلب.

3-اقترض شخص ما مبلغ 20000 جنيه على ان يسدد المبلغ بعد 12 سنة بفائدة مركبة 8%
احسب المبلغ الذى يلزم سداده فى نهاية المدة.

السؤال الثالث:-

1) ما هو الريع - معدل الريع

2) ما هو عدد السنوات التى يزيد خلالها استثمار 3000 جنيه فى الوقت الحالى ليصبح 6000 جنيه فى حالة ريع 7%

السؤال الرابع:-

a. ما هى العناصر الاساسية لتكلفة منتج ما.
b. ما اهمية دراسة الجدوى الفنية للمشروعات- مع شرح لأهم المسائل التى تعالجها دراسات الجدوى الفنية.
c. اشرح بالتفصيل أهم مراحل المفاضلة بين المشروعات.

مع أطيب التمنيات بالنجاح
ا.د/عبد الفتاح مصطفى خورشد

TANTA UNIVERSITY
FACULTY OF ENGINEERING
PRODUCTION ENG. & MECH. DESIGN DEPT.

THEORY OF MACHINES
2nd YEAR, 2008-2009
TIME: 3 HOURS

FINAL TERM EXAM

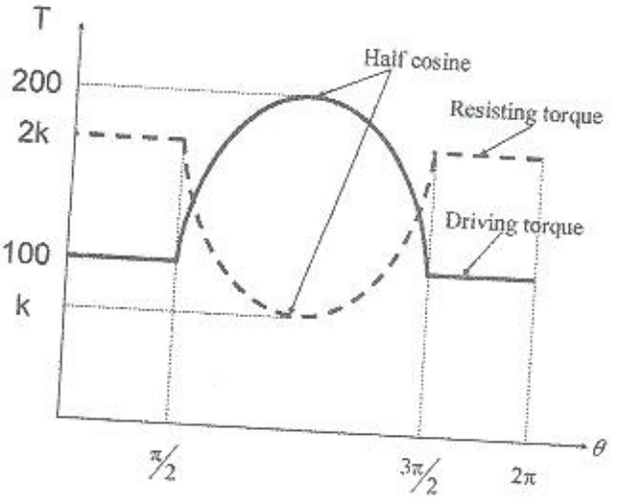
1- The driving and the resisting torque for a machine are shown in Fig. 1. The machine speed is 300 *rpm*. Find the moment of inertia of the flywheel, if the total speed variation is 3%. Also, find the maximum angular acceleration.
(Mark 15%)

2- a) Is it possible for a pinion with 16 teeth and a pressure angle of 20° to drive the following and why?
1- A rack 2- A gear with a gear ratio of 3.
b) For the gear train shown in Fig. 2, gears C and D are one unit. If the input shaft rotates at 1000 rpm (cw) and gear F is held fixed, find the speed of the output shaft.
(Mark 25%)

3- Draw the cam profile to give an oscillating roller follower the following motion:
a- Outward motion through an angular displacement of 25° during the first 120° of the cam rotation with cycloid.
b- Dwell motion during the next 60° of the cam rotation.
c- Return motion to its initial position during the next 120° of the cam rotation with S.H.M. motion.
d- Dwell motion during the next 60° of the cam rotation.
The minimum radius of the cam is 50 mm. The location of the pivot of the follower is 70 mm to the left and 60 mm above the axis of rotation of the cam. The distance between the pivot center and the roller center of the follower is 70 mm. The radius of the roller of the follower is 10 mm.
(Mark 20%)

4- For the mechanism shown in Fig. 3, the eccentric circular cam with radius 25 mm and eccentricity 15 mm rotates at uniform angular velocity of 20 rad/sec (cw). The oscillating flat face follower is in the horizontal position.
a- Locate all instantaneous centers, and then find the angular velocity of the follower 3 and velocity of the block 4.
b- Using the relative motion method, find the velocity and the acceleration of the block 4 and the angular acceleration of the follower 3.
(Mark 30%)

5- For the mechanism shown in Fig. 3, find the driving torque of the cam 2, if a resisting force F=500 N is acting vertically upward on the slider 4.
(Mark 15%)



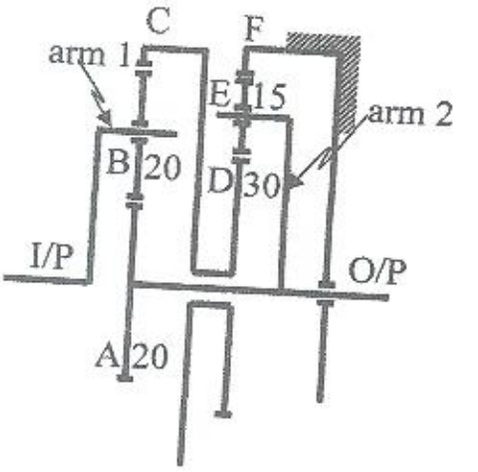


Fig. 1

Fig. 2

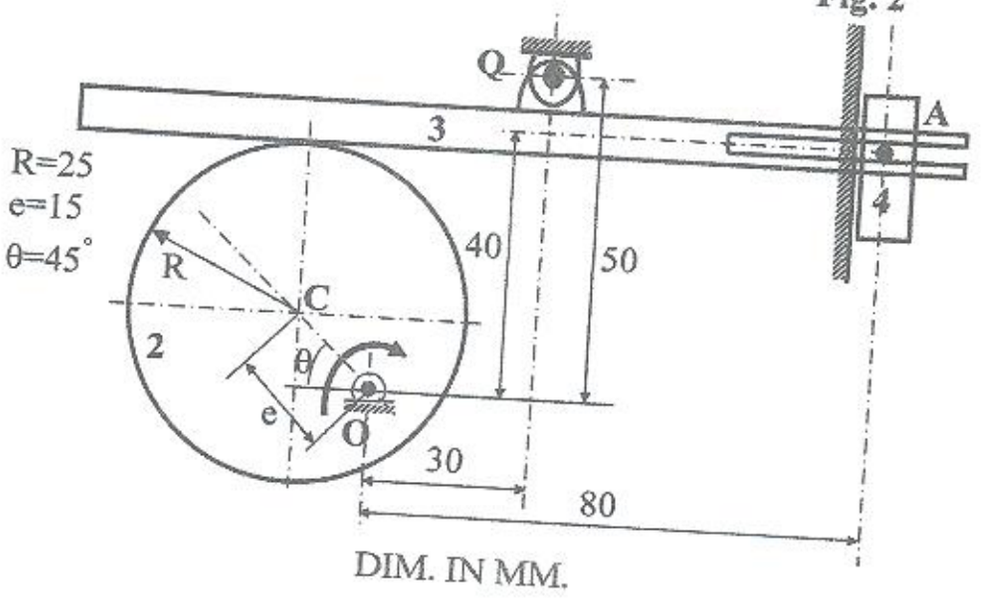


Fig. 3

Casting Of Metals
Date: 24/1/2009
Time: 3 hours

Second Year
(MPD2108)

Tanta University
Faculty of Engineering.
Production Eng.& Mach . Design Dept.

Answer all The following Questions: -

Question 1-

Write short notes about on: -

a) Developments in Sand Casting,
b) Plaster Casting,
c) Continuous Casting, and
d) Pressure Die Casting.

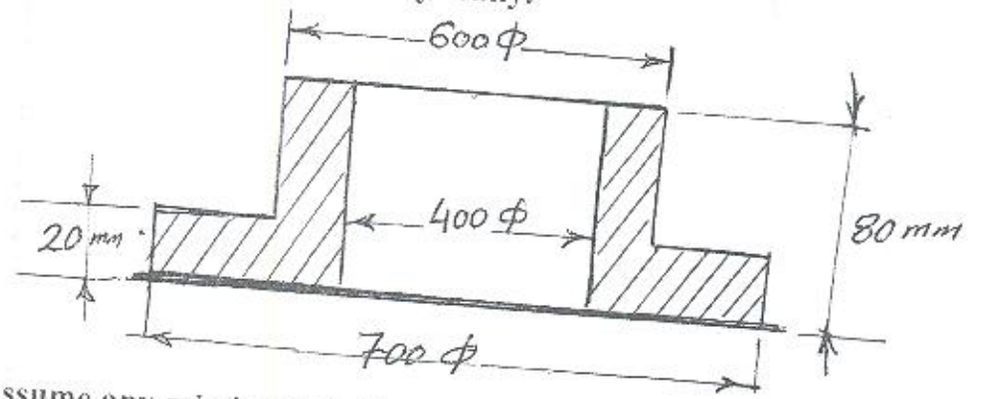
Question 2-

2-a) Explain the types of molding sand.
2-b) Characteristics of cores and core sands.
2-c) You are asked to produce the shown casting from an Al alloy.

Required:

1- The shape and Dimensions of the pattern.
2- Draw the risering equation of the Al alloy and then find out the optimum size and dimensions of the riser (or risers) required to feed the casting showing its location.

Risering equation of Al : $Fr = 1.38 / [\, 1 - (0.0417 / Vr)]$
Where, Fr = freezing ratio = (Ac / Vc) / (Ar / Vr)
Vr = volume ratio = (Vr / Vc) , use standard feeder.
- Check your results analytically.



Assume any missing data Use the tables& curves.

Some useful data:

- Coefft. Of linear thermal expansion of cast iron = 11.10^{-6} / ^{0} C.
- Coefft. Of linear thermal expansion of aluminium = 24.10^{-6} / ^{0} C.
- Freezing temperature of cast iron = 1150 ^{0} C.
- Melting point of aluminium = 660 ^{0} C.
- Machining allowance = 3 mm.

Question 3 - Write short notes about on: -

3-1- Crucible Furnaces,

3-2- Electric - Arc Furnaces,

3-3-The Cupola.

Question 4 -

4- a) Enumerate the main advantages of the casting processes over other method fabrication.

4- b) Discuss the main function of gating system.

4- c) Calculate the riser dimensions for the casting shown in Fig.1. $H' = (3/2)\ D'$

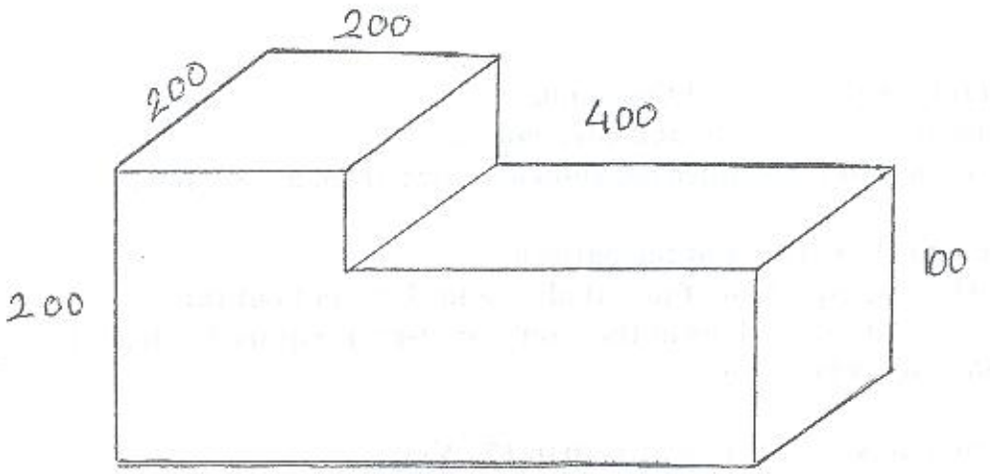


Fig 1.

Good Luck

Prof.Dr.A.M.Khourshid

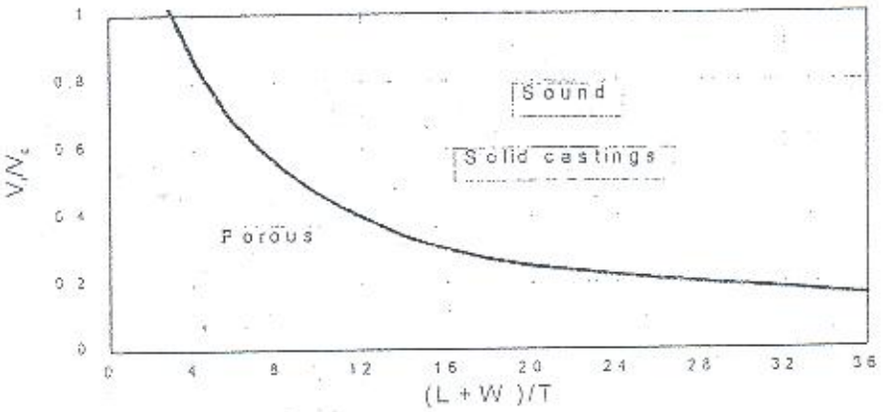


Fig.(1)

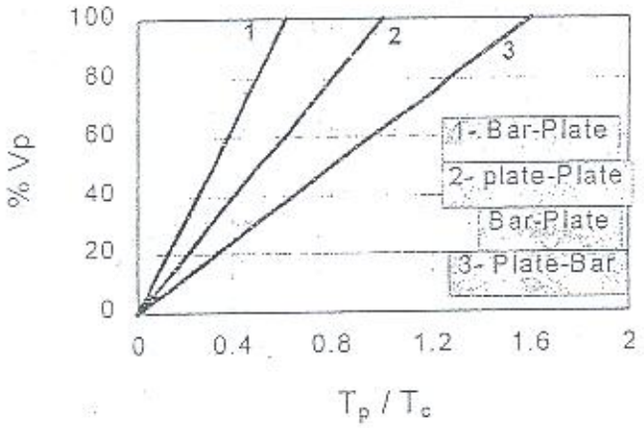


Fig.(2)

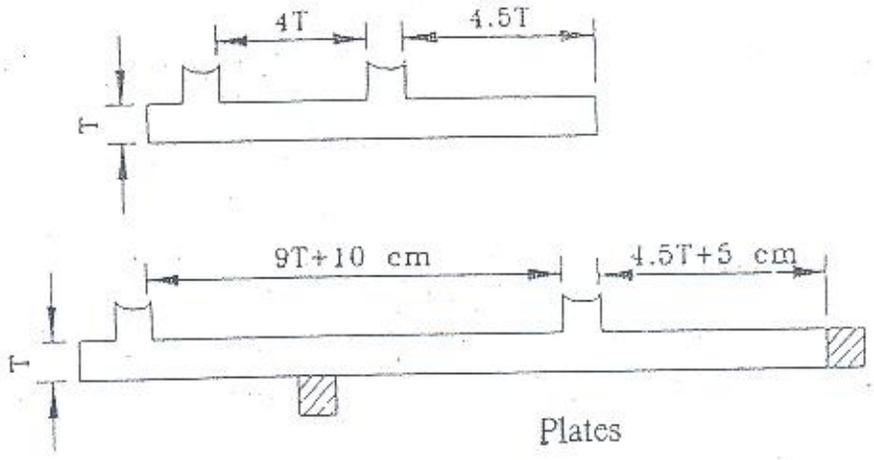


Fig.(3)

Tanta University
Faculty of Engineering
Production Engineering & Design Dept.
2nd Year Prod. 2008/2009

Stress Analysis
Monday, 26.01.2009
Time allowed : 3 hours
Final Grade : 100 Marks

Final Exam

Solve all questions and make use of the information given in the last page :

Question 1 : (30 marks)

The crane is designed for a maximum capacity of 50 KN.

a) Determine the distance x to result in a minimum value of reaction at A "R_A" .
b) Plot the normal force diagram, shearing force diagram and bending moment diagram for beam AC at the loading position where R_A has minimum value.
c) If the I-beam has a flange of 10 cm by 1 cm and web of 20 cm by 7 mm and the loading is at the middle of the beam, get the horizontal deflection of point C.
d) For same loading in c) identify the place of the critical point. If the yield stress is 540 MPa what is the factor of safety for the beam.
e) If the temperature of the beam AC only is increased by 50 °C find the change of stress in the bar BC.

Question 2 : (10 marks)

Draw diagrams showing the axial variation of twisting moment and the angle of twist for the shaft shown. Also calculate the maximum shear stress and the strain energy absorbed in the beam.

Question 3 : (10 marks)

A steel rod is subjected to direct shear load of 2 ton and normal tension of 500 kg. Determine the minimum diameter of the rod to carry the given loads according to maximum shear stress theory and von-Mises yield criterion. Use a factor of safety of 3 for both theories and 500 MPa yield stress of the steel alloy.

Question 4 : (15 marks)

Use Castigliano's theorem to get the vertical deflection of point "A" for the beam shown. The beam is loaded at its mid-span and having a modulus of elasticity E and second moment of inertia I.

Question 5 : (15 marks)

For the given state of stress determine :

a) The stress σ_x using Mohr's circle knowing that the minimum principal stress is -30 MN/m^2.
b) The value and orientation of the maximum principal stress.
c) The value and orientation of the maximum shear stress and the corresponding normal stress.

Question 6 : (20 marks)

a) A thick-walled pressure vessel is made of steel, has an inside diameter of 100 mm, and an outside diameter of 141.421 mm. The pressure inside the vessel reaches 50 MPa. Determine the stress and strain components and the resulting displacements at the inner diameter. Sketch the stress components across the wall thickness.

b) If the previous vessel is replaced by a thin walled cylinder having the same internal volume and pressure. Its material has an allowable shear stress three times more than that of the material of the thick-walled pressure vessel. What will be the thickness of the new cylinder?

Useful information:

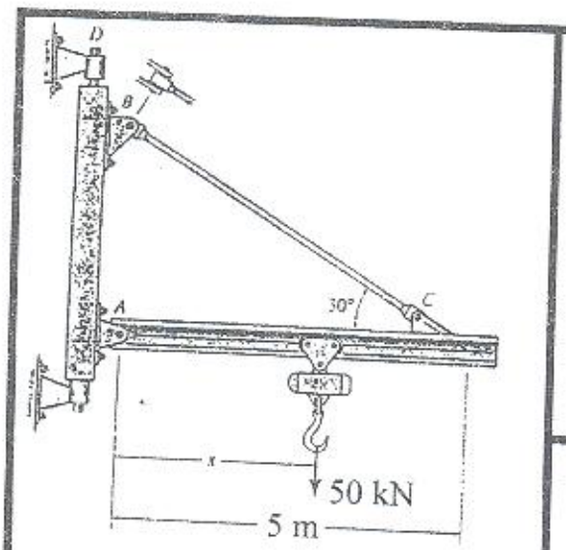
For steel : E = 200 GPa , $\nu = 0.3$, $\alpha = 12\times10^{-6}$ /°C

Principal stresses : $$\sigma_{1\atop 2} = \frac{\sigma_x+\sigma_y}{2} \pm \sqrt{\left(\frac{\sigma_x-\sigma_y}{2}\right)^2+\tau_{xy}^2}$$

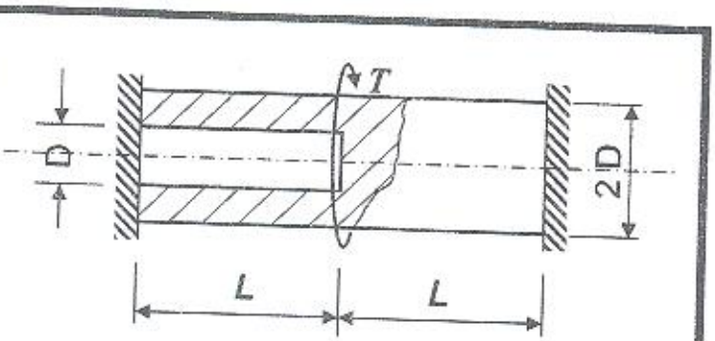
Shear stress due to transverse shear on circular cross section : $$\tau = \frac{4W}{3A}\left(1-\frac{4y^2}{D^2}\right)$$

Castigliano's theorem : $$v = \frac{\partial}{\partial P_c}\int_0^L \frac{M_z^2}{2EI}dx$$

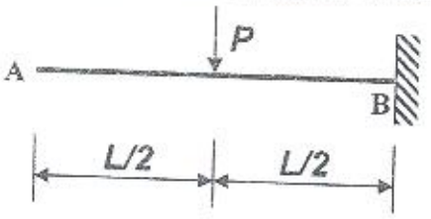
Stresses on thick-walled cylinders : $$\sigma_{r\atop\theta} = \frac{P_i}{(\lambda^2-1)}\left(1\mp\frac{r_o^2}{r^2}\right) \qquad \sigma_z = \frac{P_i}{(\lambda^2-1)}$$



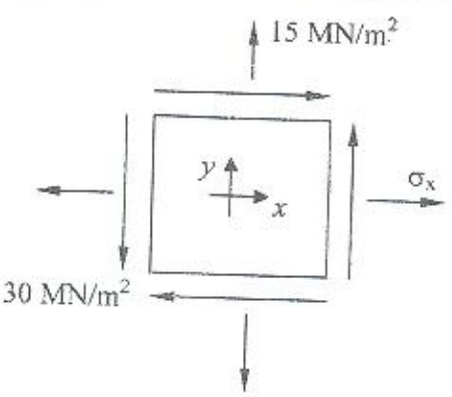
Question 1



Question 2



Question 4



Question 5

مع تمنياتي بالتوفيق و النجاح

Tanta University- Faculty of Engineering
Phy. and Eng. Mathematics Department

Engineering Mathematic(3)
Second year: Mechanical Power *Code:PME2113*
Production Engineering *Code: PME2112*

First Term Exam (28/1/2009) Total Mark: 100 Time: 3 hours

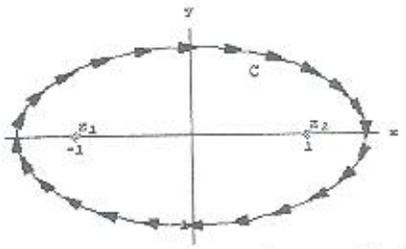
Answer the following:

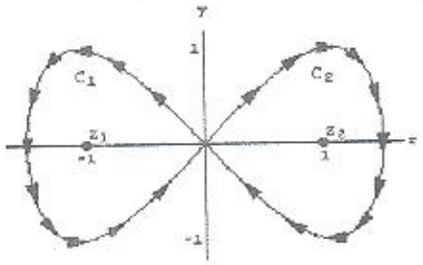
1- i) If $f(x,y)=u(x,y)+iv(x,y)$ is an analytic function show that $\frac{\partial f(x,y)}{\partial \bar{z}}=0$.

ii) Find the value of the integrals:

1- $\int_c e^{\frac{2}{z}}dz$ over the contour $c:|z|=1$. 2- $\int_0^{2\pi}\frac{1}{1+3\cos^2(\theta)}d\theta$. (20 Marks)

2- i) Evaluate $\int_c \frac{a}{(z^2-1)}dz$,where a is a constant, for the contours shown in the following two figures: (20 Marks)





ii) Show that: $\beta(n+\frac{1}{2},\frac{1}{2})=\frac{\pi}{2^{2n}}\frac{(2n)!}{(n!)^2}$.

iii) Prove that: $J_0^2(x)+2[J_1^2(x)+J_2^2(x)+J_3^2(x)+.....]=1$.

3- Find the points at which the following mapping $J(z)=z+\frac{1}{z}$ is not conformal, then use this mapping to explain that" **If the streamlines for a flow around the circle are known, then their images under the mapping $w=J(z)$ will be streamlines for a flow around the Joukowski airfoil**". (20 Marks)

4- Show that:

(i) $\Gamma(\frac{1}{2})=\sqrt{\pi}$. (ii) $\int_0^a x^4\sqrt{a^2-x^2}dx=\frac{\pi a^6}{32}$.

iii) Find the general solution of Bessel's differential equation:

$x^2y^{(2)}(x)+xy^{(1)}(x)+(x^2-\frac{4}{9})y(x)=0$. (20 Marks)

5- i) Use generating function of Bessel functions to prove that:

$\frac{2n}{x}J_n(x)=J_{n-1}(x)+J_{n+1}(x)$.

Then use it to express: $J_{3/2}(x)$ and $J_{-3/2}(x)$, in terms of $\sin(x)$ and $\cos(x)$.

ii) Prove that: $\int_0^\infty e^{2by-y^2}dy=\frac{\sqrt{\pi}}{2}e^{a^2}$. (20 Marks)

With my best wishes Dr. Waheed K. Zahra