٢ انتاج حربى

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

THEORY OF VIBRATION
3rd YEAR 2008-2009
TIME: 3 HOURS

FINAL TERM EXAM

1- A machine of mass 150 kg with a rotating unbalance of 0.5 kg.m is placed at the mid span of a 2 m long simply supported beam. The machine operates at a speed of 1200 rpm. The beam has an elastic modulus of 210×10^9 N/m^2 and a cross section moment of inertia of 2.1×10^{-6} m^4 with an assumed damping factor of 0.3.

a- Determine the response, the transmitted force and the transmissibility.

b- Show how to reduce the transmissibility.

c- In the absence of damping, design a dynamic vibration absorber such that when attached to the mid span of the beam, the vibration of the beam will cease and the absorber amplitude will be 20 mm.

For simple supported beam $k=\frac{48EI}{l^3}$. (Mark 20%)

2- The instrument shown in Fig. 1 is used to measure vertical vibrations. The base of the instrument is placed on the vibrating object whose motion is given by $x=X\sin\gamma t$ and the amplitude of the mass Z is recorded.

a- Write down the equation of motion and then find the relation between Z and X.

b- If m= 46 gm, k=3500 N/m and the instrument is used to measure the vibrations of a structure whose frequency is 1200 cpm. Find the proper ratio for l/a so that the recorded amplitude will represent the displacement of the structure to within 2% error.

c- What will happen to the accuracy of the instrument if the damping is introduced? (Mark 20%)

3- For the branched system shown in Fig. 2 find the deflections at the discs due to an external torque of 20sin 2t Nm at disc 7. The speed of shaft A is twice that of C and the speed of B is three times as that of C. The inertias in kgm^2 and stiffness in Nm/rad are given as follows:

$I_1=I_4=I_5=10$, $I_2=20$, $I_3=5$, $I_6=40$, $I_7=I_8=50$

$K_2=k_3=800$, $k_5=300$, $k_7=k_8=1600$. (Mark 20%)

4- The basic principle of vibration control in most practical cases is to keep the natural frequencies low. One of the approaches to achieve this principle is to study the effect of coupling between coordinates on the natural frequencies. For the simple model of an automobile shown in Fig. 3, the *position* of the suspension has an effect on the *coupling* between coordinate and thus on the *natural frequencies*.

Dr. Samy F. M. Assal

a- Derive the equations of motion using Lagrange's method, and then derive the condition for decoupling the coordinates.

b- Compare between the two cases (coupled and decoupled); which is better according to the principle mentioned above. Take a $= L/4$ and $I_G = 2Ma^2$ for the coupled case. (Mark 25%)

5- The objective of the suspension system of a vehicle is to isolate the rider from the unpleasant vibration due to road conditions. These conditions cause the main mass of the motorcycle shown in Fig. 4 to translate vertically in Y-direction and to rotate θ about a horizontal axis that is perpendicular to the plane of the paper.

a- Model the system taking in your consideration the following:

1- m_1 is the main mass of the motorcycle frame and I_1 is the centroidal mass moment of inertia of the main mass.

2- Z_a (k_1 and c_1) and Z_b (k_2 and c_2) are the front and back suspension of the motorcycle respectively.

3- m_2 and m_3 are the masses of the front and back wheels respectively.

4- k_3 and k_4 are the stiffness of the front and back tires respectively.

5- Y_a and Y_b the input displacements due to road conditions.

b- Derive the mathematical model of the system using Lagrange's method. (Mark 25%)

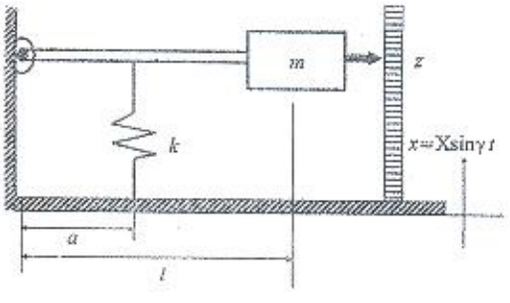


Fig.1

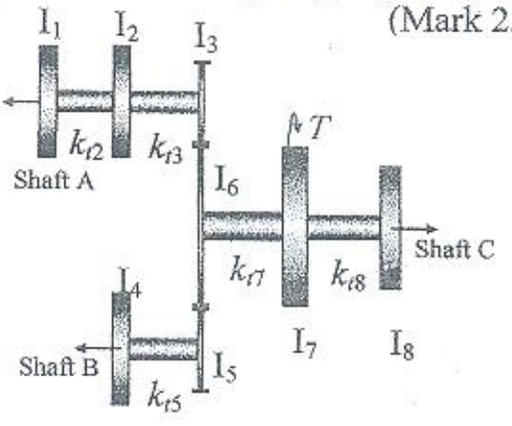


Fig. 2

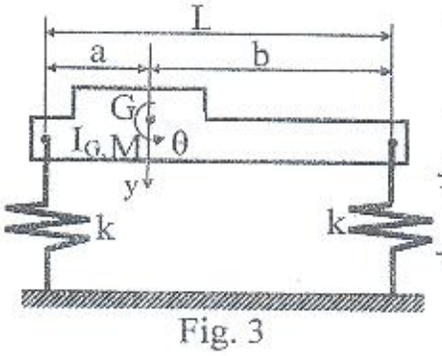


Fig. 3

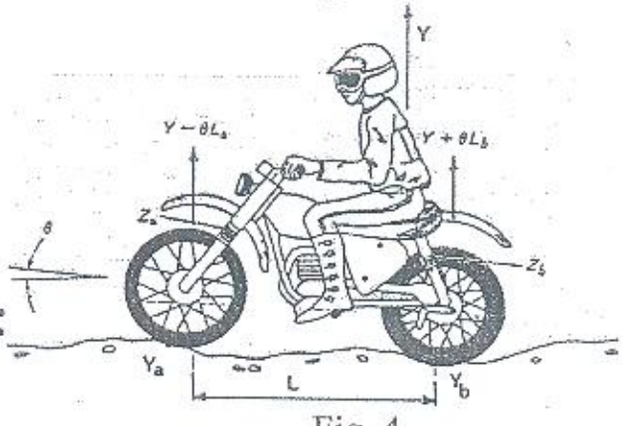


Fig. 4

20/1/2009

Tanta University
Dep. Production Eng.
Machine Design

Faculty of Engineering
Third year
Time: 3 hr

It is allowed to use one book and tables
Answer all questions

Assume any missing data

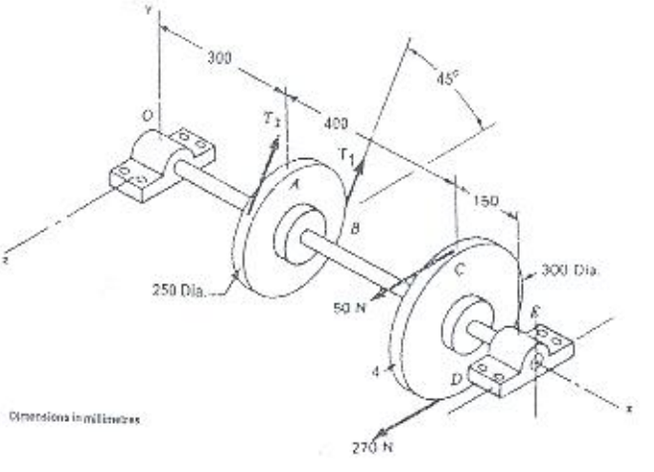
Q1 A sleeve bearing is 3 cm in diameter and 3 cm in long. The shaft rotates at 1750 RPM and the bearing subjected to a radial load of 1111 N. The clearance is 0.02 mm. Using SAE 30 oil at initial temperature of 50 C. Find the temperature rise and the minimum film thickness?
Repeat the above case with SAE 10,20, and 40 oils and compare the results. Which lubricant is the best to use? (20 points)

Q2 A 50 mm diameter bearing is 55 mm long and has a central annular oil grove 5mm wide which is fed by SAE 30 oil at 55 C and 200 kPa supply pressure. The radial clearance is 42 μm. The journal speed is 2880 RPM carrying a load of 10 kN. Find the temperature rise of the lubricant, the total oil flow, the minimum film thickness? (20 points)

Q3 A full journal bearing is rotating at 12.5 RPS and is supporting a load of 20 kN. The length to diameter ratio is 1. The journal diameter s 150 mm and the bearing diameter is 150.3 mm. A minimum film thickness of 0.06 mm is to be maintained. Oil is supplied to the bearing by means of a circumferential groove at the center of the bearing with a supply pressure of 0.4 MPa .
Determine the average temperature rise of the oil? Assume the inlet oil temperature is 30 C, which oil you choose and why? (20 points)

Q4 A shaft is mounted on bearings 400 mm apart and carries at its middle a gear 200 mm diameter causing a radial load of 10 kN and thrust load of 4 kN on the shaft which rotates at 750 RPM. Select a bearing for each end of the shaft. If the shaft is required to run 8 hours per day under light-shock condition with an average life of 10 years is desired. The shaft diameter is 50 mm, but it may be reduced at points of low moment. Also draw a net drawing for this shaft with the selected bearing? (40 points)

Q5 The figure is a schematic drawing of a counter-shaft that supports two V-belt pulleys. Radial 2-series ball bearings are to be selected and located at O&E. The counter shaft runs at 1100RPM and the bearings are having a life of 12 khr at 99% reliability using an application factor of unity. The belt tension on the loose side of pulley A is 15 percent of the tension on the tight side. What size bearings should be used if both are to be the same size? (20 points)



Tanta University	Theory of metal cutting
Faculty of Engineering	3 th year
Production and Mechanical Design Depart.	Term Exam
New system (نظام حديث) Jan. 2009	Time allowable: 3 Hours

Question One:

A) Sketch a single edge cutting tool and label the a) face, b) flank, c) nose, d) cutting edge, e) relief, f) shank.?

B) Why is the cutting speed important? What will happen at different cutting speeds, from very slow to very fast? Explain with the help of neat sketch the methods of cutting?

Question Two:

A) Which of these statement is the most correct?

a) A continuous chip with built up edge may result when we try to cut too much metal.
b) A continuous chip will result when cutting very brittle work materials.
c) A discontinuous chip will result when we use fine feeds and speeds.
d) None of the above.

B) Which of these statements is correct?

a) The cutting pressure drops as cutting velocity increases.
b) Power required drops as metal temperature and cutting velocity increase.
c) We can use the quantity of metal removed by itself to estimate the required horsepower of a machine tool.
d) All of the above.

C) A lathe toolbit with a rake angle of 20° is cutting a section of pipe with an inner diameter of 6" and an outer diameter of 6.25". The cut has a depth of 0.010" and the chip has a thickness of 0.020". If the lathe is turning at 200 rpm, and the measured cutting forces are Fc = 300 lb, and Ft = 125 lb,

a) What assumption must you make.
b) Find the following values using a graphical or numerical solution: Fs, FN, F, N, τ, φ, μ, Vc, Vf, Vs.
c) What is the minimum horsepower required for the machine?
d) Given that the tube is aluminum, use another method to find the required horsepower.

Question Three:

A) Define the cutting tool life? List the important properties of cutting tool materials and explain why each is important? What are the typical types of tool wear?

B) We are going to estimate the effects of feedrate on tool life. Some simple calculations yield the Taylor tool life coefficients of n = 0.4 and a C = 400. Find the change in tool life (in %) when velocity drops by a) 20% and b) 40%.

Question Four:

A) What are the sources of heat generation in metal cutting and show with the aid of a simple sketch the areas of heat generation that occur when using a single point cutting tool on a lathe? What are the essential properties of a cutting fluid?

B) The power required to cut a certain materials is 0.75 hP/in^3/min. A cut 0.20 in deep*0.05 in/rev feed is taken at cutting speed 100 ft/min. The work is cooled by flow of one gallon per min. of coolant with specific heat 0.85 and specific gravity 0.9 which conducts away 0.8 of the heat produced determine the rise in the temperature of coolant due to this cut in F° and C°.

Tanta University
Faculty of Engineering
Production Engineering & Design Dept.
3rd Year Prod. 2008/2009

Theory of Metal Forming
Sunday, 25.01.2009
Time allowed : 3 hours
Final Grade : 100 Marks

Final Exam

Solve all questions and make use of the information given at the end :

Question 1 : (20 marks)

a) Differentiate between engineering and true strain. Which of the two strains is used in the metal forming calculations? Justify your answer.

b) A circle 1 cm diameter was printed on a sheet of metal prior to a complex stamping operation. After the stamping, it was found that the circle had become an ellipse with major and minor diameters of 1.4 and 1.2 cm.
   i. Determine the effective strain.
   ii. If a condition of plane stress ($\sigma_3 = 0$) existed during the stamping, and the ratio $\alpha = \sigma_2 / \sigma_1$ remained constant, what ratio ($\sigma_1 / \bar{\sigma}$) must have existed?
   iii. Using the principle of normality, determine the stress ratio, $\alpha = \sigma_2 / \sigma_1$, for the von Mises and the Tresca criteria.

Question 2 : (20 marks)

a) A tensile sample of commercially pure aluminum of 15 mm diameter and 50 mm gauge length gives the following readings :

Load P (kN)	16.2	17.8	18.7	18.89	19.06
Length L (mm)	52.06	54.06	56.18	59.05	61.12

Use the above data to get the constant K in the flow stress-strain relation ($\sigma = K\varphi^n$) of the aluminum sample.

b) Aluminum wire of the material tested above has to be drawn from 3 mm diameter to 2.8 mm diameter. The friction between the die and the drawn metal is 0.35 and the die angle was taken as 25°. The prestrain of the material is 0.025 .
   i. Calculate the total drawing force required to accomplish the drawing process.
   ii. Derive an expression for the optimum die angle in the wire drawing processes.
   iii. What is the optimum die angle and how much is the reduction in the drawing force?
   iv. If the input speed is 1 m/s and the mechanical efficiency is 90 %, what is the power required for the process?

Question 3 : (20 marks)

a) Derive an expression of the force required for a deep drawing of a circular cup at any stage of the process.

b) A typical aluminum beverage can is 5.25 in high and 2.437 in in diameter.
   i. What diameter blank is required?
   ii. Is a redrawing step necessary? (Assume that a safe drawing ratio is 1.8)
   iii. Get the stress on the wall of the can at the middle of the drawing force (h=H/2) knowing that the mean flow stress at this stage is 120 MPa.

Question 4 : (20 marks)

a) Calculate the bending moment necessary to bend a sheet of thickness ***h*** and width ***b*** made of an elastic-perfectly plastic material with flow stress of σ_f . Get the final radius of curvature of the bend if the half of the section is being plastically deformed.

b) Cupper rods 25 mm in diameter are formed by hot extrusion. The billet's diameter is 75 mm and have a length of 500 mm. The mean flow stress of the heated billets is 65 N/mm^2 . Calculate the extrusion force and the power required to extrude the rods at a rate of 2 m/s.

Question 5 : (20 marks)

a) What are the undesirable effects occurring due to forming at high temperatures?

b) For a sheet having an inhomogeniety factor of 0.99 and obeys the hardening rule $\sigma = 400\,\varphi^{0.22}$. Determine the limit strain if the sheet is being stretched in one direction normal to the inhomogeneous region. (Derive the used law)

Useful information:

Flow rule: $$\frac{d\varphi_1}{(\sigma_1-\sigma_m)}=\frac{d\varphi_2}{(\sigma_2-\sigma_m)}=\frac{d\varphi_3}{(\sigma_3-\sigma_m)}=\frac{3}{2}\frac{d\bar{\varphi}}{\bar{\sigma}}$$

For wire drawing: $$F_D = A_2\,\sigma_{f_m}\ln\left(\frac{A_1}{A_2}\right)\left[1+\frac{\mu}{\alpha}+\frac{2}{3}\alpha\Big/\ln\left(\frac{A_1}{A_2}\right)\right]$$

For extrusion process: $$F_E = 1.5\,A_1\,\sigma_{f_m}\ln\left(\frac{A_1}{A_2}\right)$$

مع تمنياتى بالتوفيق و النجاح

Tanta University
Faculty of Engineering
Production and Mechanical Design Depart.
New system (نظام حديث) Jan. 2009

Machining of machine tools
3 th year
Term Exam
Time allowable: 3 Hours

Question One:

A) Define the following:
Accuracy, precision and stiffness of machine tool?

B) Prove that compliance (C) of a center lathe is given by

$C = 1/S2 + 1/S1((L-x)/L)^2+1/S3(x/L)^2$
And find out the stiffness of a center lathe.
Where:
S2 = rigidity of saddle
S1 = rigidity of head stock
S3 = rigidity of tail stock
L = Length of work piece
x= distance of cutting tool tip from head stock end.

Question Two:

A) Write a short notes with the help of neat sketches for the types of the frames, beds and ribs of machine tool?

B) Briefly explain and make neat sketches showing different forms of slide and slide ways with Illustrates how dovetails slide way system eliminates all degrees of freedom except one linear movement required for slide movement?

Question Three:

A) There are different types of the joints of machine tools.
Explain with the help of neat sketches of each type?

B) For L = 250 mm and δj(joint)/ δs(solid) =$3.1*10^{-3}$, m = $2.44*10^{-2}$ mm^{-1} for rough milling and $1.3*10^{-4}$, m = $58.46*10^{-2}$ mm^{-1} for fine grinding. Then if F is 500 Kgf., diameter of solid is 20 mm calculate the joint area necessary to fulfill the given requirements of As(soild)/Aj(joint) and δj(joint)/ δs(solid) for each value of m. also the number of bolts required if σ compression 20 Kgf/mm^2.
Where E= 2100 $Kgf./cm^2$, Pm = 0.75 $Kgf./mm^2$ and As(soild)/Aj(joint) =2/3.

Bolt diameter	Area bolt
M6	20.1
M8	36.6
M10	58.6
M12	84.3

Assume any missing data.

Question Four:

A) Why testing of machine tool is essential?

B) There are different types of testing of machine tool.
How to make different tests on the machine tool to have acceptance work piece, by explain the tests with the help of neat sketches for the lathe as an example?

c) It costs 400 $ to hire a worker, including screening costs, paperwork, and training costs. It costs 300 $ to fire a worker, including all severance and benefit costs.

d) For inventory valuation purposes, mobile costs 1.25$ to produce. The cost of carrying inventory is assumed to be 2.7 percent month (or 2.7 cents per mobile per month)

e) Assume the starting inventory is 100,000. The desired ending inventory, a year from now, is also 100,000. all forecasts demand must be met no stock outs are allowed.

Q2. عرف الضوضاء ومصادرها وأخطار ها على العمال واساليب قياسها

Q3: وضح اهمية التهوية الجيدة وطرق التهوية, كذلك الاضاءة وانواعها ومخاطر الاضاءة السيئة

مع التمنيات بالتوفيق

د.م/ احمد القصاص

Tanta University
Faculty of Engineering
Department of Pro. Des. Mech. Eng.
Year: 3rd
Subject: Refrigeration and Air conditioning

Date: 29 /1/2009
Time allowed : 3 hours
Full Mark: 50 Mark
Final Exam: 2 pages
Academic Number: MEP 31**

•Both tables and charts of refrigeration and air conditioning are allowed (available with students).
•Please, answer All questions and assume any missing data and assumptions.

1) A boot-strap cooling system is used for an aeroplane to take 10 tons load. The temperature and pressure conditions of the atmosphere are 15 °C and 0.9 bar. The pressure of air is increased from 0.9 bar to 1.1 bar due to ramming action of the plane and the ram efficiency is 80%. The pressure of air leaving the main compressor and auxiliary compressor are 3.2 bar and 4.2 bar respectively. Isentropic efficiency of both compressors is 90% and that of turbine is 85%. About 55% of the total heat of air leaving the main compressor is removed in the first heat exchanger and 30% of the total heat of air leaving the auxiliary compressor is removed in the second heat exchanger using rammed air. The required cabin pressure is 1.03 bar and the temperature of air leaving the cabin should not exceed 27 °C, determine:
   i) The plane speed in km/sec.
   ii) H.P. required to take the load in the cabin.
   iii) COP of the system.

(10 Marks)

2) An R-12 multi-store refrigeration system utilizes three cold stores operating at 15, 0, -20 °C with cooling capacities 20, 10, 15 T.R, respectively. Expansion is multiple expansion valves with two flash chambers, and thee stage compressors with intercoolers. Condensing temperature is 40°C. Assume simple vapor compression cycle except that 5°C subcooling after condenser, 5°C superheating after each evaporator and pressure drops of 50 pa in each compressor suction valve and 100 pa in each delivery valve, determine:
   i) The mass flow rate of refrigerant in kg/s and power in kW of each compressor.
   ii) COP of the cycle.

(15 Marks)

3) A room 8m × 5m and 3m height (with the longer wall oriented facing north direction) in a gymnasium building is to be conditioned. The building site is 32° North latitude. West wall separate the room from conditioned space otherwise south wall separate the room from unconditioned space and they are constructed from 100-mm face brick, 100-mm common brick. Other walls (north and east) are side streets and are constructed from 100-mm face brick, 50-mm insulation and 100-mm concrete. The room has single window facing north with 2 m × 1.5 m and 6-mm single glass having light color, medium weave shading. The average number of occupants in space is 15 persons works from 9.00 Am till 9.00 Pm. Lighting is unvented and unsuspended fluorescent lamps, Number of

lamps are 8 and each lamp has 40 watt. Inside design condition is 25 ℃ and 50% relative humidity (RH) and outdoor air is assumed to be 40 ℃ and 70 % RH. Neglect all other loading and calculate the space total load and the sensible heat foctor (SHF). Base your calculations on July, 3.00 Pm O'clock.

(15 Marks)

4) An amount of 15 kg/min of air at 45 ℃ dbt and 25 ℃ wbt is mixed with 30 kg/min of air at 4 g/kg specific humidity and 80% relative humidity. The mixture is preheated, then partially adiabatic saturated to relative humidity of 90%, then reheated to a final condition of 30 ℃ dbt and 50% relative humidity. Draw a schematic diagram of the system and plot it on the psychometric chart and then Calculate:

i) The capacity of the heaters in kW.

ii) The quantity of water consumed for humidification in kg/sec.

iii) The humidifying efficiency of the air washer.

(10 Marks)

With my best wishes ,,,,,,

Tanta University **Faculty of Engineering** **Department of Pro. Des. Mech. Eng.** **Year: 3rd** **Subject: Refrigeration and Air conditioning**		**Date: 29 /1/2009** **Time allowed : 3 hours** **Full Mark: 70 Mark** **Final Exam: 2 pages** **Academic Number: ME 31****

•Both tables and charts of refrigeration and air conditioning are allowed (available with students).
*•Please, answer **All** questions and assume any missing data and assumptions.*

1) A boot-strap cooling system is used for an aeroplane to take 10 tons load. The temperature and pressure conditions of the atmosphere are 15 °C and 0.9 bar. The pressure of air is increased from 0.9 bar to 1.1 bar due to ramming action of the plane and the ram efficiency is 80%. The pressure of air leaving the main compressor and auxiliary compressor are 3.2 bar and 4.2 bar respectively. Isentropic efficiency of both compressors is 90% and that of turbine is 85%. About 55% of the total heat of air leaving the main compressor is removed in the first heat exchanger and 30% of the total heat of air leaving the auxiliary compressor is removed in the second heat exchanger using rammed air. The required cabin pressure is 1.03 bar and the temperature of air leaving the cabin should not exceed 27 °C, determine:
   i) The plane speed in km/sec.
   ii) H.P. required to take the load in the cabin.
   iii) COP of the system.

   (15 Marks)

2) An R-12 multi-store refrigeration system utilizes three cold stores operating at 15, 0, -20 ℃ with cooling capacities 20, 10, 15 T.R, respectively. Expansion is multiple expansion valves with two flash chambers, and thee stage compressors with intercoolers. Condensing temperature is 40℃. Assume simple vapor compression cycle except that 5℃ subcooling after condenser, 5℃ superheating after each evaporator and pressure drops of 50 pa in each compressor suction valve and 100 pa in each delivery valve, determine:
   i) The mass flow rate of refrigerant in kg/s and power in kW of each compressor.
   ii) COP of the cycle.

   (20 Marks)

3) A room 8m × 5m and 3m height (with the longer wall oriented facing north direction) in a gymnasium building is to be conditioned. The building site is 32˚ North latitude. West wall separate the room from conditioned space otherwise south wall separate the room from unconditioned space and they are constructed from 100-mm face brick, 100-mm common brick. Other walls (north and east) are side streets and are constructed from 100-mm face brick, 50-mm insulation and 100-mm concrete. The room has single window facing north with 2 m × 1.5 m and 6-mm single glass having light color, medium weave shading. The average number of occupants in space is 15 persons works from 9.00 Am till 9.00 Pm. Lighting is unvented and unsuspended fluorescent lamps, Number of

lamps are 8 and each lamp has 40 watt. Inside design condition is 25 ℃ and 50% relative humidity (RH) and outdoor air is assumed to be 40 ℃ and 70 % RH. Neglect all other loading and calculate the space total load and the sensible heat foctor (SHF). Base your calculations on July, 3.00 Pm O'clock.

(20 Marks)

4) An amount of 15 kg/min of air at 45 ℃ dbt and 25 ℃ wbt is mixed with 30 kg/min of air at 4 g/kg specific humidity and 80% relative humidity. The mixture is preheated, then partially adiabatic saturated to relative humidity of 90%, then reheated to a final condition of 30 ℃ dbt and 50% relative humidity. Draw a schematic diagram of the system and plot it on the psychometric chart and then Calculate:

i) The capacity of the heaters in kW.

ii) The quantity of water consumed for humidification in kg/sec.

iii) The humidifying efficiency of the air washer.

(15 Marks)

With my best wishes ,,,,,,

Tanta University
Faculty of Engineering
Production and Mechanical Design Depart.
Old system (نظام قديم) Jan. 2009

Theory and machining of machine tool
3 th year
Term Exam
Time allowable: 3 Hours

Question One:

A) What is the metal cutting?

B) Define chip removal, non-chip removal, accuracy, precision and stiffness?

Question Two:

A) There are three types of chips that are commonly produced in cutting. Describe each type with the help of neat sketches?

B) Prove that compliance (C) of a center lathe is given by

$C = 1/S2 + 1/S1((L-x)/L)^2+1/S3(x/L)^2$

Where:

S2 = rigidity of saddle

S1 = rigidity of head stock

S3 = rigidity of tail stock

L = Length of work piece

x= distance of cutting tool tip from head stock end.

Question Three:

A) Explain the requirements for the machine tools elements to be convinced to do successful machine operation.

B) Make neat sketches showing different forms of beds, ribs, slide and slide ways of machine tools.

Question Four:

A) What roles do rake and relief angles play in cutting tools?

B) An orthogonal cut is made with a carbide tool having a 15° positive rake angle. The various parameters were noted, the cut width was 6.35 mm , the feed was set at 0.3175 mm , the chip thickness was measured to be 0.9525 mm , the cutting speed was 76200 mm./min. The forces measured were (horizontal force) Fc = 169.9 N. and (vertical force) Ft = 56.6 N. Use Merchant's Circle to scale, and the velocity diagram. From the Merchant Circle diagram find the shear angle (φ), friction force (F), friction normal force (N), and shear force (Fs). From the Velocity diagram find the friction velocity (Vf).

Calculate values for the coefficient of friction (μ) and the metal removal rate.

Question Five:

A) What are the essential properties of a cutting fluid?
State the characteristics of a lubricant used in metal cutting?

B) We are turning a 1"diameter bar, and we have a carbide tool, we want to have the last 1 shift (8 hours) before a change is required. We know that for carbide tools m = 0.2, and when the bar was cut with a velocity of 400-ft/min. the tool lasted for 2 hours. What RPM should be the lathe be set at.

Tanta University
Faculty of Engineering
Production Engineering & Design Dept.
3rd Year Prod. 2008/2009

لائحة قديمة

Theory and Machines of Metal Forming
Sunday, 25.01.2009
Time allowed : 3 hours
Final Grade : 100 Marks

Final Exam

Solve all questions and make use of the information given at the end :

Question 1 : (20 marks)

a) Differentiate between engineering and true strain. Which of the two strains is used in the metal forming calculations? Justify your answer.

b) A circle 1 cm diameter was printed on a sheet of metal prior to a complex stamping operation. After the stamping, it was found that the circle had become an ellipse with major and minor diameters of 1.4 and 1.2 cm.
   i. Determine the effective strain.
   ii. If a condition of plane stress ($\sigma_3 = 0$) existed during the stamping, and the ratio $\alpha = \sigma_2 / \sigma_1$ remained constant, what ratio ($\sigma_1 / \bar{\sigma}$) must have existed?
   iii. Using the principle of normality, determine the stress ratio, $\alpha = \sigma_2 / \sigma_1$, for the von Mises and the Tresca criteria.

Question 2 : (20 marks)

a) A tensile sample of commercially pure aluminum of 15 mm diameter and 50 mm gauge length gives the following readings :

Load P (kN)	16.2	17.8	18.7	18.89	19.06
Length L (mm)	52.06	54.06	56.18	59.05	61.12

Use the above data to get the constant K in the flow stress-strain relation ($\sigma = K\varphi^n$) of the aluminum sample.

b) Aluminum wire of the material tested above has to be drawn from 3 mm diameter to 2.8 mm diameter. The friction between the die and the drawn metal is 0.35 and the die angle was taken as 25°. The prestrain of the material is 0.025 .
   i. Calculate the total drawing force required to accomplish the drawing process.
   ii. Derive an expression for the optimum die angle in the wire drawing processes.
   iii. What is the optimum die angle and how much is the reduction in the drawing force?
   iv. If the input speed is 1 m/s and the mechanical efficiency is 90 %, what is the power required for the process?

Question 3 : (20 marks)

a) Explain with the aid of neat sketches two methods to improve the drawing ratio.

b) A typical aluminum beverage can is 5.25 in high and 2.437 in in diameter.
   i. What diameter blank is required?
   ii. Is a redrawing step necessary? (Assume that a safe drawing ratio is 1.8)

Question 4 : (20 marks)

a) Calculate the bending moment necessary to bend a sheet of thickness h and width b made of an elastic-perfectly plastic material with flow stress of σ_f . Get the final radius of curvature of the bend if the half of the section is being plastically deformed.

b) Cupper rods 25 mm in diameter are formed by hot extrusion. The billet's diameter is 75 mm and have a length of 500 mm. The mean flow stress of the heated billets is 65 N/mm^2 . Calculate the extrusion force and the power required to extrude the rods at a rate of 2 m/s.

Question 5 : (20 marks)

a) What are the undesirable effects occurring due to forming at high temperatures?

b) For a sheet having an inhomogeniety factor of 0.99 and obeys the hardening rule $\sigma = 400\,\varphi^{0.22}$. Determine the limit strain if the sheet is being stretched in one direction normal to the inhomogeneous region. (Derive the used law)

Useful information:

Flow rule: $$\frac{d\varphi_1}{(\sigma_1-\sigma_m)}=\frac{d\varphi_2}{(\sigma_2-\sigma_m)}=\frac{d\varphi_3}{(\sigma_3-\sigma_m)}=\frac{3}{2}\frac{d\bar{\varphi}}{\bar{\sigma}}$$

For wire drawing: $$F_D = A_2\,\sigma_{f_m}\ln\left(\frac{A_1}{A_2}\right)\left[1+\frac{\mu}{\alpha}+\frac{2}{3}\alpha\Big/\ln\left(\frac{A_1}{A_2}\right)\right]$$

For extrusion process: $$F_E = 1.5\,A_1\,\sigma_{f_m}\ln\left(\frac{A_1}{A_2}\right)$$

مع تمنياتى بالتوفيق و النجاح

جامعة طنطا
كلية الهندسة
قسم هندسة الإنتاج والتصميم الميكانيكي
الفرقة الثالثة (لائحة قديمة) - المادة : دراسات بيئية

التاريخ: 2009/1/22
الزمن : ساعتان
الدرجة العظمى : 60 درجة
الامتحان النهائي في ورقة واحدة

أجب عن الأسئلة الآتية:

السؤال الأول:

أ- ما المقصود بمفهوم البيئة وما هي أنواعها ومكوناتها؟

ب- ما مفهوم التلوث وما هي مستوياته وأنواعه ؟

ج- تكلم بالتفصيل عن الأنظمة الرئيسية التي أثبتت كفاءتها في السيطرة على تلوث الهواء ، ويمكن إضافتها إلى معظم العمليات الصناعية لتنظيف المداخن.

(15 درجة)

السؤال الثاني:

أ- أذكر مصادر تلوث المياه، وما هي الأسباب التي تؤدى إلى تلوث المياه بالنفط؟

ب- تكلم تفصيليا عن المعالجة البيولوجية (Biological treatment) فى معالجة مياه الصرف ؟

ج- ما المقصود بالطمر الصحي ، وما هى أهم الشروط التي يجب توافرها عند اختيار موقع طمر النفايات؟ وما هي أهم المزايا الايجابية لهذه الطريقة؟

(15 درجة)

السؤال الثالث:

أ- تكلم بإيجاز عن المصادر الصناعية للتلوث بالإشعاع؟

ب- ما هو المبدأ الأساسي لمراقبة البيئة؟ وما هي فوائد مراقبة البيئة ضمن خطة طويلة الأمد؟

ج- ما هي العوامل التي يجب الاعتماد عليها عند اختيار الجهاز الامثل والأنسب للتحكم في ملوثات الهواء؟

(15 درجة)

السؤال الرابع:

أ- ما المقصود بالطاقة القابلة للاسترجاع (المتجددة) والطاقة الغير متجددة، مع ذكر أنواع كلا منها؟ ثم اشرح فكرة عمل الخلايا الفولت ضوئية؟

ب- اشرح مع الرسم محطة توليد الطاقة الكهربائية باستخدام الطاقة الجوفية وأذكر مدى مساهمتها في العمل على تقليل التلوث؟

ج- ما المقصود بالصناعات التحويلية وما مدى تأثيرها على البيئة؟ وما هي العوامل التي تحكم التوطن الصناعي؟

(15 درجة)

مع التمنيات بالنجاح ،،،،،

امتحان ترم

جامعة طنطا
كلية الهندسة
قسم هندسة الإنتاج و التصميم الميكانيكي
الفصل الدراسي الأول 2008-2009

المادة : أجهزة قياس المترولوجية
الفرقة: الثالثة (لائحة قديمة)
الزمن : ثلاث ساعات
التاريخ: 20 يناير 2009

اجب عن كل الأسئلة الآتية:

السؤال الأول:

(أ) اشرح بالتفصيل الفرق بين الخطأ الاستاتيكى والتصحيح الاستاتيكي.
(ب) ما هي الطرق المستخدمة في معايرة الميكرومتر مع شرح الشروط الواجب توافرها عند أجراء الاختبارات .
(ج) أذكر الأنواع المختلفة للميكروميترات مع شرح نظرية عملة موضحا ذلك بالرسم .
(د) إذا أديرت اسطوانة القياس بميكروميتر خارجي بمقدار 9 أجزاء . علما بان خطوة قلاووظ عمود القياس 0.5 mm. أوجد قيمة قراءة الميكروميتر؟

السؤال الثاني:

(أ) اشرح نظام تدريج الزاوية البصرية دقة " 2.5 .
(ب)باستخدام مجموعة قوالب قياس الزوايا (افرضها) أوجد القوالب المختارة لتكوين الزوايا المطلوب التالية:

$13^{o}, 37^{o}, 28^{o}\ 40^{"}, 1^{o}\ 1^{"}\ 30^{'}$

(ج)عرف قوالب القياس مع ذكر أنواعها المختلفة. أشرح كيفية استخدامها في تعين الخطأ الصفري للقدمه؟
(د) اذكر مع اشرح طرق التكبير الميكانيكية والبصرية موضحا ذلك بالرسم؟

السؤال الثالث:

(أ) تكلم عن أجهزة القياس ذات الهواء المضغوط المستخدمة في قياس الطول مبينا أهم المميزات.
(ب)بين بالشرح طرق قياس كل من الاستواء و الاستدارة.
(ج)اشرح كيفية قياس تخانة السنة عند قطر الخطوة و أيضا قياس عمق السنة ؟
(د)عدد الطرق المختلفة التي تستخدم في قياس تضاريس الأسطح المشغلة مع شرح أحداهما موضحا ذلك بالرسم.

السؤال الرابع:

(أ) تكلم عن أجهزة القياس المقارنة الضوئية وقارنها مع أجهزة القياس المقارنة الميكانيكية من حيث نسبة التكبير و الإغراض الشائعة في الاستخدام.
(بان التجاوزات الهندسية ضرورة تحتمها الظروف الفنية ، اشرح هذه العبارة ؟
(ج)أذكر ما تعرفه عن المنقلة ذات الورنية موضحا ذلك بالرسم.
(د) بين الفرق بين الدقة والضبطية ؟ عرف ما يلي : البعد – المقاس- الانحراف – التفاوت – التوافق – رتبة التفاوت .

السؤال الخامس:

(أ)اشرح استخدام أجهزة القياس البصرية في قياس الزوايا التي تتطلب دقة عالية؟
(ب) حدد نوع التوافقات الآتية : $50H7/p6$, $50H8/f7$

حيث حدود التفاوت تعرف كالتالي :

$H8 = +0.046: +0.000$, $H7 = +0.003: +0.000$,
$f7 = -0.030: -0.060$, $p6 = +0.051: +0.032$

(ج) اشرح باختصار التجاوزات الأساسية للنظام الدولي .
المطلوب إيجاد قيمة التجاوز الأساسي من الرتبة السادسة لمجال الأقطار من 30: 50 مم ز إذا علم أن قيمة التجاوزات من الرتبة السادسة i10.
(د) اشرح تركيب فرجار التقسيم ذو الورنية . موضحا ذلك بالرسم مع ذكر أهم مميزاته.
عرف ما يلي : خطأ الخلفية – خطأ الخطية – الفترة الميتة – المنطقة الميتة – المعايرة الديناميكية و التتابعية والعشوائية.

a- Derive the equations of motion using Lagrange's method, and then derive the condition for decoupling the coordinates.

b- Compare between the two cases (coupled and decoupled); which is better according to the principle mentioned above. Take a $= L/4$ and $I_G = 2Ma^2$ for the coupled case. (Mark 25%)

5- The objective of the suspension system of a vehicle is to isolate the rider from the unpleasant vibration due to road conditions. These conditions cause the main mass of the motorcycle shown in Fig. 4 to translate vertically in Y-direction and to rotate θ about a horizontal axis that is perpendicular to the plane of the paper.

a- Model the system taking in your consideration the following:

1- m_1 is the main mass of the motorcycle frame and I_1 is the centroidal mass moment of inertia of the main mass.

2- Z_a (k_1 and c_1) and Z_b (k_2 and c_2) are the front and back suspension of the motorcycle respectively.

3- m_2 and m_3 are the masses of the front and back wheels respectively.

4- k_3 and k_4 are the stiffness of the front and back tires respectively.

5- Y_a and Y_b the input displacements due to road conditions.

b- Derive the mathematical model of the system using Lagrange's method. (Mark 25%)

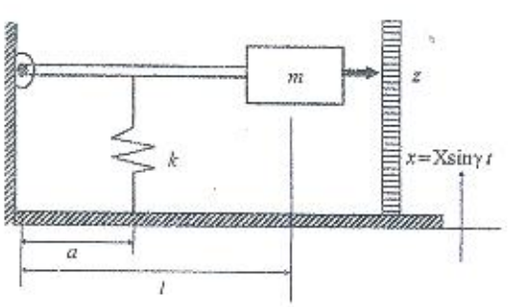


Fig.1

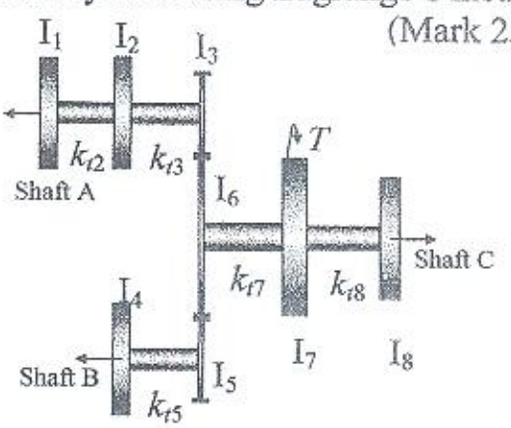


Fig. 2

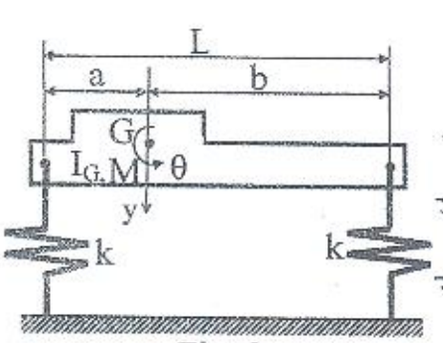


Fig. 3

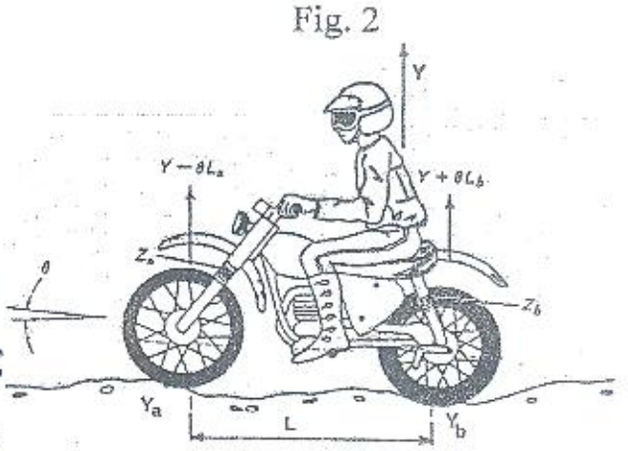


Fig. 4

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

THEORY OF VIBRATION
3rd YEAR 2008-2009
TIME: 3 HOURS

FINAL TERM EXAM

1- A machine of mass 150 kg with a rotating unbalance of 0.5 kg.m is placed at the mid span of a 2 m long simply supported beam. The machine operates at a speed of 1200 rpm. The beam has an elastic modulus of 210×10^9 N/m^2 and a cross section moment of inertia of 2.1×10^{-6} m^4 with an assumed damping factor of 0.3.

a- Determine the response, the transmitted force and the transmissibility.
b- Show how to reduce the transmissibility.
c- In the absence of damping, design a dynamic vibration absorber such that when attached to the mid span of the beam, the vibration of the beam will cease and the absorber amplitude will be 20 mm.

For simple supported beam $k=\frac{48EI}{l^3}$.

(Mark 20%)

2- The instrument shown in Fig. 1 is used to measure vertical vibrations. The base of the instrument is placed on the vibrating object whose motion is given by $x=X\sin\gamma t$ and the amplitude of the mass Z is recorded.

a- Write down the equation of motion and then find the relation between Z and X.
b- If m= 46 gm, k=3500 N/m and the instrument is used to measure the vibrations of a structure whose frequency is 1200 cpm. Find the proper ratio for l/a so that the recorded amplitude will represent the displacement of the structure to within 2% error.
c- What will happen to the accuracy of the instrument if the damping is introduced?

(Mark 20%)

3- For the branched system shown in Fig. 2 find the deflections at the discs due to an external torque of 20sin 2t Nm at disc 7. The speed of shaft A is twice that of C and the speed of B is three times as that of C. The inertias in kgm^2 and stiffness in Nm/rad are given as follows:
$I_1=I_4=I_5=10$, $I_2=20$, $I_3=5$, $I_6=40$, $I_7=I_8=50$

$K_2=k_3=800$, $k_5=300$, $k_7=k_8=1600$.

(Mark 20%)

4- The basic principle of vibration control in most practical cases is to keep the natural frequencies low. One of the approaches to achieve this principle is to study the effect of coupling between coordinates on the natural frequencies. For the simple model of an automobile shown in Fig. 3, the *position* of the suspension has an effect on the *coupling* between coordinate and thus on the *natural frequencies*.

Dr. Samy F. M. Assal