ميكانيكا فوى

جامعة طنطا
كلية الهندسة

قوانين وتشريعات
الزمن: ساعتان
التاريخ:٢٠٠٧/٦/١٧

اجب علي أربعة من الأسئلة التالية:

١- للأفراد الحرية في أن يتعاقدوا كما يشاءون ، ولكن هناك قيود تحد من حرية هذا التعاقد ، إشرح بايجاز هذه القيود التي تحد من حريةا التعاقد وذلك بالنسبة للعقود المدنية.

٢- عرف الأنواع المختلفة من العقود المدنية التالية:
- عقود الإذعان
- العقود المسماه
- العقود غير المسماه
- العقود الرضائية
- العقود الشكلية

٣- ماهي المبادئ الرئيسية التي قامت عليها الإتفاقية العامة للتجارة والتعريفات - التي تهدف إلي تحرير التجارة العالمية ، مع تسمية أهم ما صدر عنها من إتفاقيات بهذا الخصوص؟

٤- تقوم العقود المدنية الرضائية على ثلاثة أركان رئيسية ، إشرح بايجاز هذه الأركان الثلاثة؟

٥- ماهي المستندات أو الوثائق التي يجب أن تكون مصحوبة مع عقد المقاولة وخاصة بالنسبة للمقاولات الكبيرة ، وكيف يتم ضمان العمل بعد إستلامه من المقاول؟

Tanta University	(2006/2007) Second Semester	Third Year
Faculty of Engineering	Selective course (1)	June 3, 2007
Mechanical Power Eng. Dept.	Combustion	Time: 3 hours

Answer the following questions. Use of gas tables are allowed. Mark

1. a) For an elementary reaction of generic form: $aA + bB \rightarrow cC + dD$ [12]
   deduce an equation to estimate the net reaction rate of A as well as the reaction equilibrium constant, K_c.
   b) Using the simplified laminar flame model, deduce an equation for estimating laminar burning velocity.
   c) What are the major types of elementary reactions?,
   And what is the generic processes set of simple chain reactions?

2. a) What are the main sources of nitrogen oxide in combustion process?, [12]
   Use the extended Zeldovich mechanism to deduce the equation used to estimate the rate of formation of NO.
   b) Using "Borghi diagram" explain types of premixed turbulent flames.
   c) Describe the conditions which are most conductive to minimize the spark ignition energy.

3. Calculate the chemical availability of methane gas, CH_4. [10]

4. Solid carbon reacts with steam to produce carbon monoxide and hydrogen. For a carbon to hydrogen atom ratio of 1/1 and a carbon to oxygen atom ratio of 1/1, find the equilibrium composition at 1500 K and at 1 atm. The reaction is; $C(s) + H_2O = CO + H_2$ [10]

5. A closed chamber initially contains 1500 ppm of CO, 5% O_2 and the remainder is N_2 at 1500 K and 1 atm. Determine the time for 60% of the CO to react assuming only the elementary reaction; [10]

$$CO + O_2 \rightarrow CO_2 + O$$

The reaction rate constant $k = 2.5\times10^{6} \exp(-24060/T)$ $(gmol^{-1}.m^{3}.s^{-1})$.

6. Estimate the laminar burning velocity of a stoichiometric methane-air mixture initially at 298 K and 1 atm, using the simplified model of the laminar flame theory and considering the one step global reaction rate where; $r_f = -1.3\times10^{11} \exp[-48400/(1.987T)] \cdot (n_f)^{-0.3} (n_{O2})^{1.3}$ [16]
   Take ignition temperature = 537 °C.

Good luck,,,, Prof. Dr. S. H. El-Emam

ميكانيكا قوى

كلية الهندسة جامعة طنطا
قسم القوى الميكانيكية
المادة : الات حرارية ٢

العام الدراسي ٢٠٠٦-٢٠٠٧ (دور يونية)
السنةالدراسية: ثالثة ميكانيكا قوى
استاذ المادة: دكتور خالد محمد سعد الدين

امتحان نهاية نصف العام الثانى دور يونية

عدد الصفحات ٢	عدد الأسئلة٥	اجب علي جميع الأسئلة

الزمن : ٣ ساعات

السؤال الاول

١- اذكر مع الشرح والرسم التفصيلى انواع دوائر التبريد لمحركات الاحتراق الداخلى مع ذكرمزايا وعيوب كل نوع . مع ذكر اثار التبريد الزائد على المحركات.

٢- اذكر انواع الاحتكاك فى محركات الاحتراق الداخلى – اشرح طرق التغلب علية فى الاماكن التالية: نهايتى زراع التوصيل – عامود المرفق

السؤال الثانى

١- استنبط أداء الخلاط المثالى (التصورى) لمحركات الاشعال بالشرارة بدلالة نسبة الهواء الذائد (excess air factor) .

٢- احسب قطر فوهة الوقود لخلاط بسيط يعمل على محرك ذو ستة اسطوانات قطر الاسطوانة ٩٠ مم وطول الشوط ١٠٠ مم – يدور بسرعة ٦٠٠٠ لفة/د وقطر عنق الخلاط ٤٥ مم . يستخدم المحرك خليط معامل الهواء الزائد له ١,٠٥ و التركيب الوزنى للوقود المستخدم ٨٤ % كربون ، ١٦ % هيدروجين – الكفائة الحجمية للمحرك ٠,٨٥ .

السؤال الثالث

١- ارسم مع الشرح دائرة التغذية بالوقود لمحركات الاشعال بالضغط موضحا جميع المكونات ووظائفها.

٢- اذكر مع الرسم انواع بخاخات (رشاشات) الوقود من حيث شكل وعدد الفوهات.

السؤال الرابع

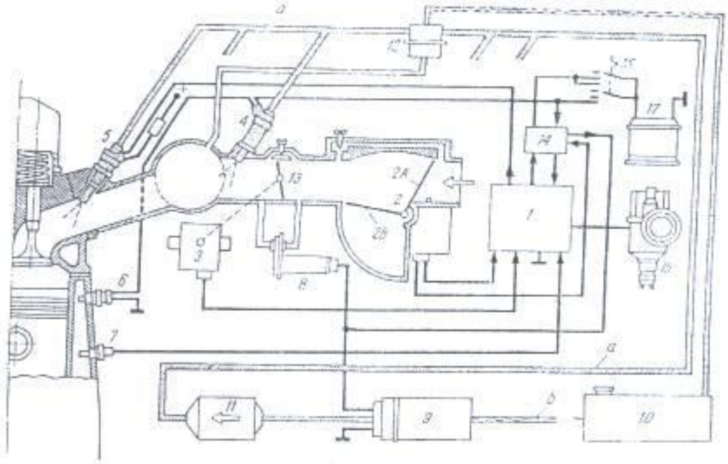
١- اذكر مع الرسم انواع طلمبات حقن الوقود المكبسية المستخدمة فى محركات الاشعال بالضغط.

٢- اذكر مع الرسم انواع منظمات السرعة (Governors) . استنبط العلاقة الرياضية للمنظم من النوع (simple watt governor)

السؤال الخامس

١- عرف مايلى: Droop, Stability, Stability period

٢- اذكر الطرق الحديثة المستخدمة لتحسين خلط الوقود بالهواء فى محركات الاشعال بالشرارة. فى الشكل المرفق اذكر اى من الطرق الموضحة بالشكل مع بيان اسماء الاجزاء المرقمة وطريقة العمل.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TANTA UNVIRSITY FACULTY OF ENGINEERING PRODUCTION ENG. DEPT.	MACHINE DESIGN FINAL EXAM.	3rd YEAR (POWER) DATA: 2007-05-30 TIME: 3 HOURS

STUDENTS MAY AEEUME ANY MISSING DATA

1- Design a flat belt drive and the drive pulley, to transmit 35Kw, from an electrical motor running at 900rpm to a centrifugal pump at approximately 300rpm. Assume, belt material-leather (chrome-tanned), velocity of belt v=20 m/s allowable stress for belt σ_t=20kg/mm^2. The material of the pulley, with permissible shear stress=125 kg/mm2, allowable bending stress σ_b =350 kg/mm^2) .

2- An electric motor with a power of (150)HP and runs at (1440rpm). A flange coupling with six bolts transports the motor motion into a sliding spur gear box with three different speed. The gear box is connected to a pair of bevel gears with a reduction ratio i_b=3. The bevel gears connected to two wheels of a vehicle with diameter 375mm of each one. The wheel run with three different linear velocities v_1,v_2,v_3 equal 71, 50 and 35.5 Km/hr. In a sliding spur gears, the first and second number of gear teeth is 36 with pitch circle diameter is 144mm of each other.

Design and Calculate:

1-The power in KW, number of revolutions in rpm, torsion moment for shafts

2- Determine the number of teeth for all six gears and It's dimensions.

3- Design the sliding spur gear, with safe pinion bending stress equal σ_o=20kg/mm^2

4-design the spline shaft No. (I) including the spline key, if the safe shear stress for the shaft τ_{sh}=300 kg/mm^2, permissible shear and crushing stress for the key equal 500, 1500 kg/mm^2, respectively.

5-Design a CI flange coupling (shaft, key, hub, flange and belts) with permissible shear stress for shaft, bolts and key= 500kg/mm^2, crushing stress for bolt and key=1500kg/mm^2 and shear stress for CI flange coupling=800kg/mm2. Assume the number of bolts=6 bolts

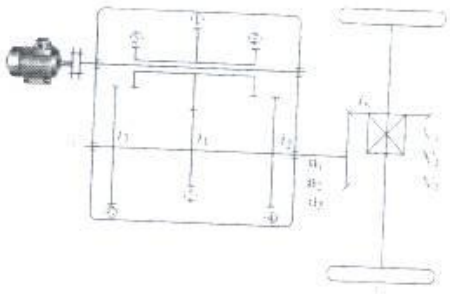


Fig. 1

STUDENTS MAY AEEUME ANY MISSING DATA

For belt:

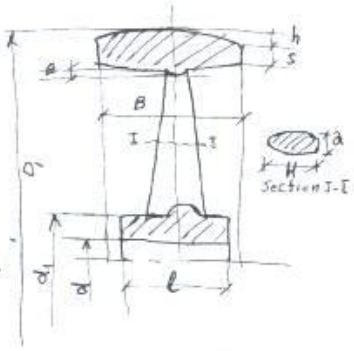
D/C=25 ,ε = (1:2) %, n_b=(3:5), A_{min}= 2(D_1+D_2), L_{min}=v/n_b, μ=0.3,L_f = L+ Δl ,Δl=(10:20) cm

$$L = 2A_{min} + \frac{\pi}{2}(D_1 + D_2) + \frac{(D_2 - D_1)^2}{4A_{min}} \rightarrow mt$$

$$A_{min} = \frac{1}{8}[2L_{min} - \pi(D_1+D_2) + \sqrt{[2L_{min} - \pi(D_1+D_2)]^2 - 8(D_2-D_1)^2}] \rightarrow mt$$

Pulley dimensions:

e=h=0.5 S mm, S=0.005D_1+3mm,
B=1.1b+(10:15)mm,
d_1=(1.8:2.0)d, l=(1.5:2.0)d, H=(1.5:2.0)S



For gear:

Cs=1.5 , Cv=0.32 ψ= (8:12) =10 Φ=20 °
Y= 0.154- (0.921/z), Z_{min}= (16:20),
Stander modulus (2,2.5,3,3.5,4, 4.5, 5, 5.5, 6, 8, 10, 12, 16, 20).

For spur gear:

Dynamic force

$$F_d = F_t + \frac{20.67v(Cb + F_t)}{20.67v + \sqrt{Cb + F_t}} \qquad C = \frac{e}{K_1\left(\frac{1}{E_p} + \frac{1}{E_g}\right)}$$

K_1=9 for Φ=20 ° E_p =E_g =26.0 10^3 kg/mm^2 e=(0.025:0.05) C: dynamic factor

$$F_w = \sigma_b . b . \pi . m . y \frac{1}{K_f}$$ *K_f :stress concentration factor K_f=1.5 at Φ=20 °*

Hardness number BHN=300 σ_{en}=1.75.(BHN) MPa

Wear force

$$F_W = d_p . b . Q . k \qquad Q = \frac{2Z_g}{Z_p + Z_g}$$ *K material combination factor =5*

For helical gear

C_w is lubrication factor = (1.15-1.35)

Dynamic force

$$F_d = F_t + \frac{20.67V(Cb\cos\beta + F_t)\cos\beta}{20.67V + \sqrt{Cb\cos\beta + F_t}}$$ *B=20 ° and Φ=20 ° cv=0.5*

Wear force

$$F_w = d_p . b . Q . k \frac{1}{\cos^2\beta}$$

College of Engineering University of Tanta	**Refrigeration and Air Conditioning** Final Exam, June 2007	3rd Year Power Mech. Eng. **Time:** THREE Hours

Assume any missing data and assumptions. Tables and charts of Refrigeration & air Conditioning are Allowed.

1. a) Sketch the flow diagram (with all parts on the drawing) of the cascade cycle and sketch its P-h diagram. Discuss in brief its applications.

b) A refrigeration cycle has a single evaporator and 2-stage compression with flash intercooling is used as a heat pump. The system uses R-22 and has multiple expansion valves. Evaporator is at –20°C and condenser is at 40°C with 360 kW heating capacity. Determine:

i) the intermediate pressure for intercooling,

ii) amount of refrigerant flowing in each compressor, and

iii) COP of the system.

2. a) Salty-water desalination is one of the main important applications of refrigeration. Explain and show with the aid of sketches an example of using refrigeration in water desalination.

b) A summer air conditioning system utilizes a filter, chilled water cooling coil and a supply fan. The system services a space having a total load of 100 TR with a SHF of 0.70. Fresh air requirement is estimated to be 20% of the total air flow rate. Outside air is at 40°C DBT and 48% RH while inside design condition is 24°C DBT and 50% RH. Sketch the duct system layout and the process psychrometric chart.

i) If air leaving the cooling coil has 96% RH, determine air flow required to carry the space load.

ii) Determine the conditions of air entering the space and the cooling coil dew point temperature.

iii) Find the capacity of the cooling coil in TR and its sensible load.

3. a) Write down (no proof) the relation of the max efficiency of the absorption refrigeration cycle. Explain how it could be interpreted as the product of two different efficiencies of well-known simple thermodynamic cycles.

b) A 360 TR capacity absorption system uses lithium-bromide water solution with a heat exchanger (HX-1) between the absorber and the generator and a liquid-to-suction heat exchanger (HX-2). Assume 8°C subcooling in HX-2. Neglect pump work and assume saturated conditions for states: leaving absorber, strong solution leaving generator, leaving condenser, and leaving evaporator. Draw the cycle flow diagram and use the following temperature:

in evaporator =	5°C,	entering condenser =	110°C
leaving condenser =	50°C,	leaving absorber =	40°C,
entering generator =	80°C,	strong solution leaving generator = 100°C, and	

strong solution leaving HX-1 = 60°C

Determine the properties of all state points and find the cycle COP.

4. The top floor of a hotel building is to be conditioned. There are 15 rooms in one line with doors facing east on an 60 m-long unconditioned corridor, each is 6 m x 4 m and 3 m height. Each room has single window facing west with 2.4 m x 2.1 m and 6-mm single glass having dark color, medium weave shading. The floor underneath is conditioned. All walls are constructed of 200 mm concrete block. Ceiling is of mass inside insulation type with suspended ceiling and R-value = 3.7 m^2 K/W. Each room could be occupied by 2 persons. Lighting is 16 W/m^2 and other load sources could be assumed 18 W/m^2. Indoor air is at 24°C and 50 % relative humidity (RH) and outdoor air is assumed to be 38°C and 50 % RH. Calculate the space total load assuming infiltration rate of 10 L/s per person. Base your calculations on 21 August, 15:00 O'clock and 32° north latitude.

Best wishes ... **Assoc. Prof. Dr. Alsaied Khalil**

Tanta University	3rd Year Prod. Engg
Faculty of Engineering	Renewable Energy
Mech. Power Department	Time 3 Hrs.

Answer the following questions
Assume any missing data

1-a) Describe with neat sketches the operation of fuel cell

b) Find the growth rate per year and the doubling time if the energy consumption rate in the year 2000 is 500 $x10^{18}$ J/year and the energy consumption rate was 70.8 x 1018 J/year in 1970. For a coal reserve of $70x10^{21}$ J, estimate how long will coal will last as an energy source if it supplies all the fuel energy starting from year 2005 (assume the growth rate is constant)

2- A flat plate solar collector in El-Mansoura (31°E and 30.5° N) is tilted at 42° from the horizontal and pointed due south . Calculate the incidence angle and the beam radiation incident on the surface at 10 AM Egypt standard time on February 21

3- a)Calculate the overall heat loss coefficient for a single-cover flat-plate solar collector with the following given data:

Collector size 2m x 4m — Collector tilt, s =30°
Thickness of each glass cover = 2.3 mm — Thickness of absorber plate =0.5 mm
Space between cover and absorber = 25 mm — Thickness of back insulation = 50 mm
Insulation thermal conductivity, k_{ins}=0.045 W/m.K
Mean absorber temperature, T_p=100°C=373 K
Ambient air temperature = Sky temperature T_{sky}=10°C=283K
Absorber plate emissivity, $\varepsilon_p = 0.10$
Glass emissivity, $\varepsilon_g = 0.88$ Wind related heat transfer coefficient = 10 W/m^2.K. If the mean absorber temperature is increased to 120°C, what is the percentage decrease in the overall heat loss coefficient

b) If the solar collector described above is used to power a cooling system, and the water temperature at collector inlet is 80°C, If the collector heat removal factor F_R equals 0.95 and the transmittance-absorptance product $(\tau\alpha)_n$ equals 0.85, and the ambient temperature is 10 °C, evaluate the efficiency of the collector if the radiation intensity is 600 W/m^2. If the water exit temperature is 95 °C calculate the water flow rate.

4-a) Prove that, for air at 101.3 kPa and 273 K, the wind power through a given area A is given by:

P_w=0.647 AU^3 W, where U is the wind speed in m/s.

b) State an expression for the capacity factor CF for wind turbines using the Weibull distribution

$f(U) = (k/c)\,(U/c)^{k-1}\,EXP[-(U/c)^k]$

5-The Weibull parameters at a given site are c = 6 m/s and k = 1.8 . Estimate the number of hours per year that the wind will be between 6.5 and 7.5 m/s. Estimate the number of hours per year that the wind speed is greater than or equal to 15 m/s.

مع تمنياتي

أ.د/أحمد حامد

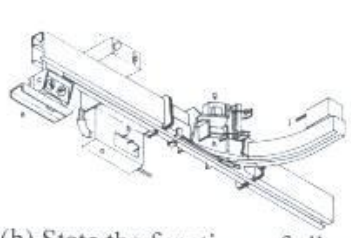
Tanta University
Faculty of Engineering

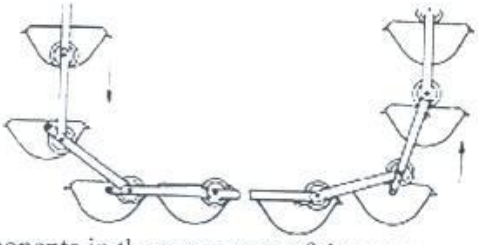
3rd Year Mechanical Power
Material Handling Equipment

Final Exam May 2007

Question (1)

(a) For continuous flow conveyors;
- State the common conditions of justified applications.
- State the type and function of the two shown conveyors.





(b) State the functions of all components in the conveyors of the types;
(b.1) Fixed–path trolley. (b.2) Carrying-weight belt.

Question (2)

(a) In a jib crane, the conical pendulum causes the unbraked trolley to accelerate relatively along the horizontal boom, and also to resist extra side reaction. Carry out a force analysis to explain this principle.

(b) In a cylindrical crane, if the boom span is L=4 m long, joints horizontal spacing is b=2 m, telescopic piston speed is dS/dt=11 cm/sec, and weight is G=6 tons, plot the diagrams of $\theta(S)$, $\phi(S)$, $d\theta(S)/dt$, $d\phi(S)/dt$, P(S), and R(S) in the range [2<S<4], for the case of a common actuating point.

Question (3)

A Cartesian crane 7.5 m high is used to handle a box weighing G =3 tons from position (10,8,1) to position (16,2,4) in 3 minutes. The parts weights are G_f=1.2 ton for frame and G_t=0.2 ton for trolley. The friction coefficients are 0.24 for trolley wheels and 0.35 for frame tires;

(a) Find the overall needed power to carry out this operation.

(b) In the case that only the lifting wire fails to start, while the crane other moving parts stop suddenly; analyze the box free oscillation.

TANTA UNIVERSITY FACULTY OF ENGINEERING MECH. POWER DEPART. THIRD YEAR	FLUID MECHANICS EXAM. Time allowed: 3 hours Date: 6/6/2006

Please, Answer five only of the following questions:

1) *Find the diameter of the nozzle and the maximum power transmitted by a jet of water discharging freely out of a nozzle, fitted to a pipe 300 m long and 10 cm diameter with a Darcy friction coefficient as 0.04. The available gross head is 90 m. Find also the velocity of water at the nozzle exit and the efficiency of transmission.*

2) *The difference in levels between the catchment reservoir and the service reservoir of a town supply is 180 m and the distance between them is 64 km. A single pipe designed to carry 27×10^6 liters per day originally connected the reservoirs. It was later found necessary to increase the flow by another 9×10^6 liters per day, and it was decided to lay another pipe of the same diameter alongside the first pipe over part of the length, the two pipes being cross-connected (in parallel).*
Calculate the diameter of the pipes and the length of the second pipe, which is necessary to be laid. Take $f = 0.032$ for each pipe.

3.1) *Write down the factors affecting the water hammer.*

3.2) *Water is flowing through a 2 km long pipe of 20 cm diameter and 0.8 cm wall thickness with a velocity of 2 m/s. Calculate the rise in pressure due to water hammer, if the valve at the end of the pipe line is closed instantaneously. Take the Bulk's modulus of elasticity of water as 2.1×10^9 Pa, and the Young's modulus of elasticity of the pipe material is equal to 21×10^{10} Pa.*
Find also the time taken by the pressure wave to return at the valve after the valve is closed.

4.1) *Specify the dimensionless parameters that control the coefficients of drag and lift.*

4.2) *Prove that the coefficient of viscous drag on a sphere is* $C_D = \dfrac{24}{\mathbf{Re}}$.

4.3) *A truck having a projected area of 6.5 m^2 travelling at 70 km/hr has a total resistance of 1962 N, 20 % of this is due to rolling friction and 10 % due to surface friction. The rest is due to form drag. Calculate the coefficient of form drag. Take for air* $\rho = \mathbf{1.22\ kg/m^3}$.

5) *A Pitot-static tube is placed in a subsonic air flow. The static pressure and temperature in the flow are 96 kPa and 27℃ respectively. The difference between the Pitot and static pressures is measured and found to be 32 kPa. Find the air velocity:*

a. Assuming an incompressible flow,

b. Assuming compressible flow.

Estimate the percentage error incurred in using the incompressible Pitot-static tube equation in calculating the velocity of compressible flow.

6) *For the steady flow of viscous incompressible fluid between two parallel fixed flat plates, the Navier-Stokes equations combined with the continuity equation are reduced to*

$$\mu \frac{d^2u}{dy^2} = \frac{dp}{dx}$$

Where u = u (y) is the flow velocity component in x-direction that is a function of y only.

Find relations for the followings:

a) velocity distribution,
b) maximum velocity,
c) average velocity,
d) discharge,
e) wall shear stress,
f) skin friction coefficient.