c) 2.25 kg of a fluid having a volume of 0.1 m^3 are contained in a cylinder at a constant pressure of 7 bar. Heat energy is supplied to the fluid until the volume becomes 0.2 m^3. If the initial and final specific enthalpies of the fluid are 210 kJ/kg and 280 kJ/kg respectively, **determine**:

i) The quality of heat energy supplied to the fluid,

ii) The change in internal energy of the fluid.

(25 Mark)

3) a) **Determine** the work done for the following process:

i) Isothermal process

ii) Polytropic process

b) **Write** the steady flow energy equation for the following: (1) a compressor (2) a condenser

c) Air flows through a pipe with a variable cross section. At the pipe inlet, the pressure is 6.0 bar, the temperature is 27 °C, the area is 35 cm^2, and the velocity is 60 m/s. At the pipe exit the conditions are 5 bars and 50 °C, and the cross-sectional area is 20 cm^2. **Find** :

i) the mass flow rate, in kg/s,

ii) the exit velocity, in m/s, and

iii) the rate of heat transferred to or from the pipe in kW.

(20 Mark)

4) a) **Prove** that for ideal gases :

$$C_p = R + C_v$$

b) **Show** a P-V diagram for an ideal reciprocating gas compressor, and **prove** that for reversible polytropic compression : $W_n = \frac{n}{n-1} P_1 V_1 \left[1 - \left(\frac{P_2}{P_1} \right)^{(n-1)/n} \right]$

c) A cylinder contains 0.28 m^3 of a perfect gas at 1.035 bar and 29 °C. The gas is compressed according to the low $PV^{1.3}$ = constant until the volume is reduced to 0.028 m^3. Heat energy is then supplied at constant pressure until the volume becomes 0.056 m^3. **Determine**:

i) The temperature and pressure at the end of each process.

ii) The total change in internal energy.

iii) The work energy transfer during each process.

(20 Mark)

With my best wishes **Dr. Abdelkader saad**

Tanta University
Faculty of Engineering
Department of Mechanical Engineering
Year : First Subject: Thermodynamics
Name:

Date: 7/6/2012
Time allowed : 3 hours
Full Mark: 90 Mark
Final Exam: 2 pages
Academic Number: MEP 1203

•Both tables and charts of steam are allowed (available with students). مسموح للطالب بالدخول بخريطة وجداول البخار

•Please, answer All questions and assume any missing data and assumptions.

Notes: For air, $C_p = 1.005$ kJ/kg. k , $C_v = 0.718$ kJ/kg. k and $R = 0.287$ kJ/kg. k

1) a) **What** do you know about:

i) Intensive and extensive properties ii) open and closed system

iii) Process iv) cycle

b) A rigid vessel of volume 0.5 m^3 initially contains a water-vapor mixture at 400 kPa.

i) If the quality of the mixture is 40%, **calculate** the mass of the mixture.

ii) If the pressure in the vessel is raised to 700 kPa by the transfer of heat, **what** will be the mass of the vapor and the mass of the liquid?

c) **Complete** the flowing table:

P (bar)	T (°C)	h (kJ/kg)	x (kg_v/kg)	State
.....	200	.....	0	.....
4	.....	.....	0.85	.....
150	.....	.....	.....	Saturated vapor
80	.....	855	.....	.....
20	400	.....	.....	.....

(25 Mark)

2)

a) **Mention** the definition of the first law of thermodynamics.

b) A gas cycle consists of five processes with the following values of heat, work and change in internal energy. **Complete** the following table and **calculate** the thermal efficiency.

Process	1	2	3	4	5
Process type	Adiabatic	V=constant	P=constant	Adiabatic	V= constant
Q (kJ/kg)	.....	40	60	.....	.....
W (kJ/kg)	-30	.....	.....	.....	.....
ΔU (kJ/kg)	.....	.....	.....	-40	-70

Problem number (3) **(35 Marks)**

a) In details use separation of variable metho. to solve the following heat equation $\frac{\partial^2 w}{\partial x^2}=\frac{\partial w}{\partial t}$, $0<x<L,\ t>0$, according to the boundary conditions $w(0,t)=0$, $w(L,t)=0$ and the initial condition $w(x,0)=f(x)=\begin{cases} x & 0<x\le L/2 \\ L-x & L/2\le x\le L. \end{cases}$

b) Find the solution of partial differential equation $u_x=x+2y+2u$.

c) The temperature distribution in the rod is modelled by the parabolic equation $\alpha\frac{\partial^2 T}{\partial x^2}=\frac{\partial T}{\partial t}$ where $T=$ temperature as a function of location, x and time, t in which the thermal diffusivity, α is given by $\alpha=\frac{k}{\rho C}$, $k=$ thermal conductivity of rod material, $\rho=$ density of rod material, $C=$ specific heat of the rod material use the implicit method to find the temperature distribution in the rod of length $L=0.05$m from $t=0$ and $t=6$ seconds. If the rod is subjected to a temperature of $100°C$ on the left end and $25°C$ on the right end and the initial temperature of the rod is $20°C$. Use $\Delta x=0.01m$, $\Delta t=3s$. Given: $k=54\frac{W}{m.K}$, $\rho=7800\frac{kg}{m^3}$, $C=490\frac{J}{kg.K}$.

With my best wishes

Dr. Waheed Kamal Zahra

Tanta University

Department: Physics and Engineering Mathematics
Total Marks: 100 Marks

Faculty of Engineering

Course Title: Eng. Math.2(b)	First Year Mech.PME1207
Date: 10/6/2012	Allowed time: 3 hrs — No. of Pages: (2)

Remarks: (answer the following problems… assume any missing data)

Problem number (1) (30 Marks)

a) The motion of the coupled system shown in Fig 1 is represented by the following system of simultaneous second order ordinary differential equations. $M_1x_1^{(2)} = -k_1x_1 + k_2(x_2 - x_1)$ and $M_2x_2^{(2)} = -k_2(x_2 - x_1)$. Solve this system under the assumption that: $M_1 = M_2 = 1,\ k_1 = 6,\ k_2 = 4,\ x_1(0) = x_2(0) = 0,\ x_1^{(1)}(0) = 1$ and $x_2^{(1)}(0) = -1$ using Laplace transform.

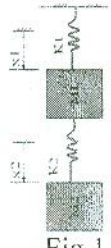


Fig 1

b) Find Laplace transform of the following:

1-$f(t) = \sin^2 5t$ 2-$f(t) = \sinh 3t \cos 3t$ 3-$f(t) = te^{-t}\sin 2t$

c) Use Laplace transforms to prove that $\int_0^\infty \frac{e^{-t}\sin t}{t}dt = \frac{\pi}{4}$.

d) Find inverse Laplace transform of $G(s) = \frac{8s+4}{s^2+6s+13}$ and $F(s) = \ln(1+\frac{1}{s})$.

Problem number (2) (35 Marks)

a) Apply Laplace transform to solve the wave equation $u_{tt} = u_{xx}$, subject to the boundary and initial conditions: $u(0,t) = u(1,t) = 0, u(x,0) = 0$ and $u_t(x,0) = \sin \pi x$.

b) Consider the following system of differential equations:

$x_1^{(1)} = x_1 + 5x_2 + t$, $x_2^{(1)} = -x_1 + 7x_2 + 1$, $x_1(0) = 1$, $x_2(0) = 3$.

a) Write down the above system in matrix form.
b) Find Eigenvalues and Eigenvectors.
c) Find the homogenous solution.
d) Find the general solution.

c) Show that for $-\pi < x < \pi$, $|\sin x| = \frac{2}{\pi} - \frac{4}{\pi}(\frac{1}{1.3}\cos 2x + \frac{1}{3.5}\cos 4x + \ldots)$.

Hence find the value of $\frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} + \ldots$

d) Consider the following function:

$$f(x) = \begin{cases} 0 & -\pi < x < 0 \\ \frac{x}{2} & 0 < x < \pi \end{cases},$$

- Plot the above function if $f(x + 2\pi) = f(x)$
- Find Fourier series of this function.

جامعة طنطا
كلية الهندسة
الفرقة الاول ميكانيكا

بسم الله الرحمن الرحيم
إمتحان الفصل الدراسى الثانى
المادة مقاومة المواد

الزمن ٣ ساعات
يونيه ٢٠١٢

اجب عن اربعة اسألة فقط :

(١)- ا- اشرح تأثير كلا مما يأتى على خواص الصلب الميكانيكية فى اختبار الشد :
التشغيل الميكانيكى – المعالجات الحرارية – درجات الحرارة

ب – اجرى اختبار شد على عينة من الصلب قطرها ٢٠ مم ، وكانت قراءات الحمل بالطن والاستطالة المنظرة بالمم كما يلى :-

الحمل بالطن	٣,٧٥	٧,٥	٧,٥	٨,٥	١١	١٢	١٢,٥	١١,٥	١٠
الاستطالة بالمم	٠,٠٦	٠,١٢	١,٤	٤	١٢	١٨	٢٤	٢٩	٣٢

حيث أن طول القياس ٥٠ سم

ارسم منحنى الحمل والتشكل ثم عين مايلى :
اجهاد الخضوع – مقاومة الشد – النسبة المئوية للأستطالة – معاير المرونة – معاير الرجوعية – معاير المتانة .

(٢) – ا- اذكر صعوبات اختبار الضغط والاجراءات التى يمكن اتخاذها للتغلب على هذة الصعوبات .
ب- كمرة معدنية ذات مقطع دائرى وبحرها ٤٦ سم ومحملة فى منتصف البحر بحمل مركز يزداد تتريجيا حتى الكسر

فكانت قيم الاحمال وسهم الانحراف عند منتصف البحر بالمم كما يلى :-

الحمل بالطن	صفر	٠,٦	١	١,٤	١,٨	٢,٢	٢,٦	٢,٧٤	٢,٨
الانحراف بالمم	صفر	٠,٥	٠,٨	١,٢	١,٥	٢	٣	٤	٥

ارسم منحنى الحمل والتشكل ثم عين :
قطر الكمرة اذا كان معاير المرونة لمادتها ٨٠٠ طن / سم٢ – اجهاد حد التناسب – معاير الكسر – معاير الرجوعية فى الانحناء – معاير المتانة – ارسم شكل الكسر المتوقع لهذة الكمرة .

(٣)- ا – عين زاوية ميل مستوى الكسر للمعادن فى اختبار الضغط .
ب- اذكر الاحتيطات الواجب مراعاتها عند اجراء اختبار برنل للصلادة .
ج- اشرح اختبار القص الغير مباشر ، ولماذا سمى بهذا الاسم .
د- اشرح طريقة عمل احد مقاييس الانفعال الميكانيكية .

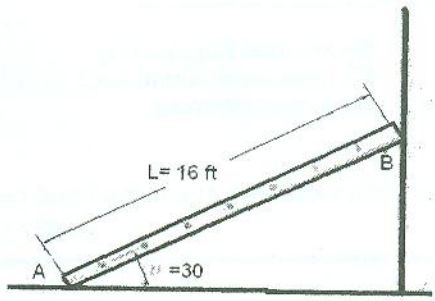
(٤) – ا- اذكر مجالات استخدام اختبار الصلادة فى الصناعة .
ب- اذكر انواع اختبرات الثني والغرض من كل نوع .
ج- ارسم ماكينة الاختبرات العامة الهيدروليكية مبيننا طريقة الحصول على الحمل وقياسة
د- عين ابعاد اصغر عينة اختبار من الصلب تستخدم فى اختبار برنل للصلادة حيث رقم برنل للصلادة لهذا الصلب ٢٥٠ ثم احسب مقاومة الشد لهذا الصلب المختبر .

(٥) – ا- اشرح اختبار روكويل للصلادة بالتفصيل واذكر مميزاتة عن اختبار برنل .

ب- اشرح كيف يمكن تعين ثوابت انون معمليا .
ج- اجرى اختبار التواء على سبيكة ما على شكل انبوبة سميكة الجدار قطرها الخارجى ١,٥ بوصة وطول القياس لها ١٠ بوصة وعزم التواء الخضوع ١٥٠٠٠ رطل بوصة وعزم الالتواء الاقصى ٢٥٠٠٠ رطل بوصة وزاوية الالتواء عند الكسر ١٠١٠° - عين الاتى :
اجهاد الخضوع فى القص – المقاومة القصوى فى القص – معاير المتانة حيث القطر الداخلى نصف القطر الخارجى

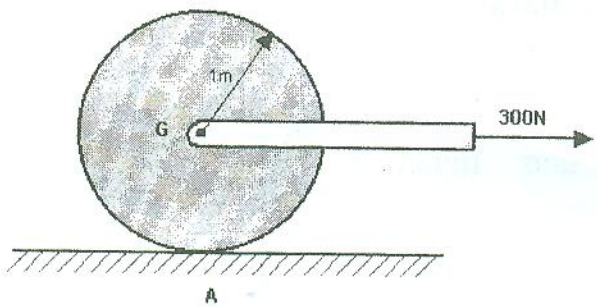
Question (4) **(16 marks)**

At a given instant the bottom A of the ladder has acceleration $a_A = 4$ ft/s^2 and velocity $v_A = 6$ ft/s, both acting to the left. Determine the velocity and acceleration of the top of the ladder, B, at this instant



Question (5) **(22 marks)**

The shown disk is pulled horizontally with a force of 300 N. The disk has a mass of 100kg. Knowing that $\mu_s = 0.20$ and $\mu_K = 0.15$. Determine the acceleration and angular acceleration of the disk.



All the best

Dr. Yasser EL-Samadony

Tanta University		Mechanical Power Engineering Department Course Title: Applied Mechanics MEP 1201		Faculty Of Engineering

Dept	Mechanical Engineering	Date	3/06/2012
Year	1st, (new curriculum) 2005	Allowed time	3 hrs
Final exam	June (second term)	Total marks	85 Marks
		Academic Number	2011/2012

Close book exam. All questions must be answered. Draw schematic whenever applicable, and clearly state your assumptions

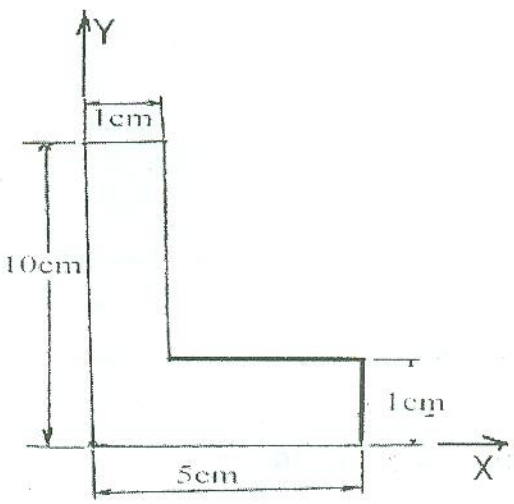
Question (1) (14 marks)

A vertical circular gate of radius 1.2 m is completely submerged in water. If the centre of the gate is at a depth 18 m, determine the value of the resultant water force on the gate and its location from water free surface.

Question (2) (18 marks)

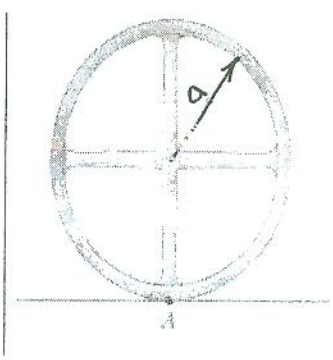
For the L shape section shown, determine:

(a) The principal axes
(b) The maximum and minimum moment of inertia
(c) The moment of inertia about axes making an angle of 15 clockwise with respect to x- axes



Question (3) (15 marks)

The wheel consists of a thin ring having a mass M1 and four spokes made from slender rods, each having a mass M2. Determine the wheel's mass moment of inertia about an axis perpendicular to the page and passing through point A. Given: M_1 = 10 kg M_2 = 2 kg and a = 500 mm



TANTA UNIVERSITY

FACULTY of ENGINEERING

DEPARTMENT OF ELECTRICAL POWER AND MACHINES ENGINEERING

EXAMINATION (FIRST YEAR) STUDENTS OF MECHANICAL ENGINEERING

COURSE TITLE: ELECTRICAL AND ELECTRONIC ENGINEERING			COURSE CODE: EPM1241
DATE: 17/06/2012	TERM: SECOND	TOTAL ASSESSMENT MARKS: 75	TIME ALLOWED: 3 HOURS

NOTES: ANSWER AS MANY QUESTIONS AS YOU CAN AND ANSWER AS BRIEF AS POSSIBLE.

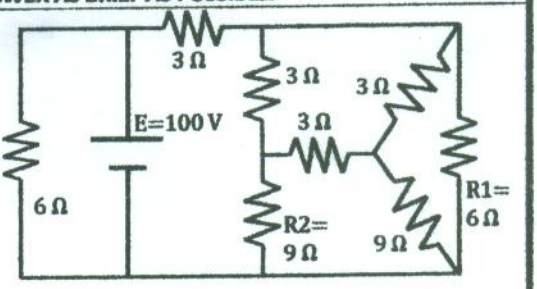
Q1 (15 Marks): For the circuit shown, calculate:

i. The total resistance.

ii. The current in the resistances R1 and R2.

iii. The total power dissipated in the circuit.

iv. The source current if the resistance R1 is replaced by short circuit.

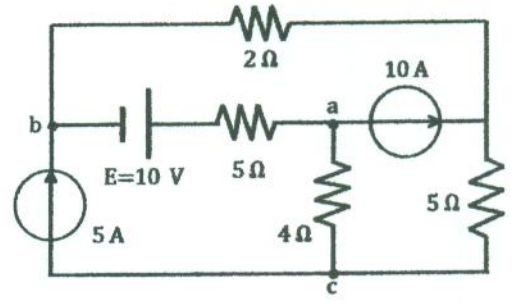


Q2 (15 Marks): For the circuit shown in the Figure:

i. **Calculate** the current in each element

ii. **Prove** that the total power dissipated equals the total power generated.

iii. **Calculate** the voltages Vab and Vbc.



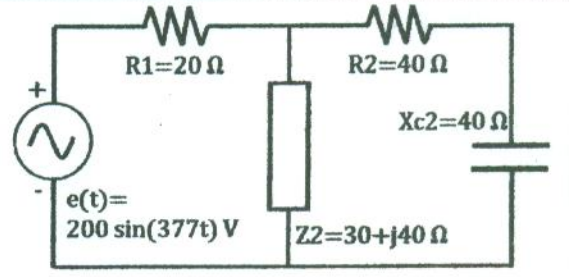
Q3 (15 Marks): For the circuit shown in the Figure:

i. **Calculate** the current in each element.

ii. **Calculate** the total impedance.

iii. **Prove** that the generated active power is equal to the consumed active power.

iv. **Calculate** the input power factor.

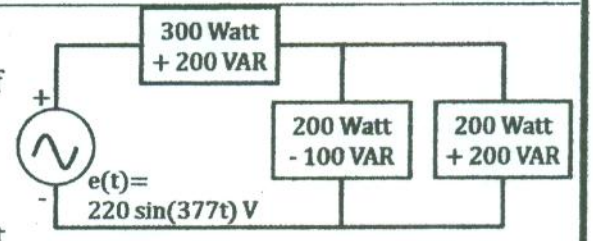


Q4 (15 Marks): For the circuit shown in the Figure:

i. **Find** the total number of watts, the total number of VARs, the total number of VA and input power factor.

ii. **Sketch** the power triangle.

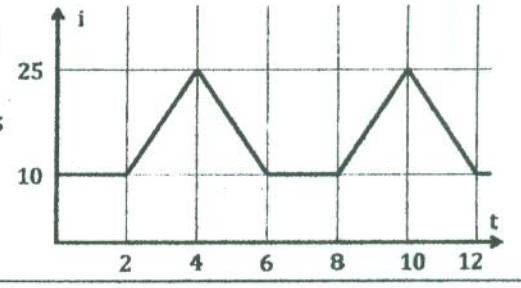
iii. **Find** the source current and the series equivalent circuit



Q5 (15 Marks):

A. **Find** the frequency, average value, and effective value (RMS) of the waveform shown in the Figure.

B. **What** are the main differences between semiconductors and conducting materials? **Explain** the applications of P-N junction in rectifying the alternating current signals.



End of Exam

Wish you all the best

Dr. Ayman Hoballah