



TANTA UNIVERSITY
FACULTY of ENGINEERING
DEPARTMENT OF ELECTRICAL POWER AND MACHINES ENGINEERING
EXAMINATION (SECOND YEAR) STUDENTS OF ELECTRICAL ENGINEERING



COURSE TITLE: ELECTRICAL POWER ENGINEERING (1)		COURSE CODE: EPM2106	
DATE: 10/01/2013	TERM: FIRST	TOTAL ASSESSMENT MARKS: 90	TIME ALLOWED: 3 HOURS

Notes:

Systematic arrangement of calculations and clear neat drawings are essential.
Any data not given is to be assumed – Answer as many questions as you can.

الإمتحان مكون من 4 أسئلة في ورقتين

Answer as brief as possible

Q1: (25 Marks)

A. Write brief comments about the following expressions:

1. Skin Effect
2. Self inductance
3. Corona
4. Transposition of conductors

(6 Marks)

B. Find the inductance per unit length and capacitance of balance three phase whose conductors are placed at the corners of a triangle whose sites 2, 3, and 5 meter where the diameter of each conductor is 2 cm. (6 Marks)

C. A three phase transposed 345 kV, 200 km transmission line has the following line impedance $z = 0.032 + j 0.35 \text{ ohm/km}$, and the admittance $y = j 4.2 \text{ } \mu\text{s/km}$. The full load at the receiving end of the line is 700Mw at 0.99 leading power factor and 95% of rated voltage. Assume a medium length line, determine:-

1. ABCD parameters of the nominal π circuit.
2. Sending end voltage, current, and active power.
3. Transmission line efficiency and voltage regulation.
4. Draw the complete Phasor diagram.

(13 Marks)

Q2: (20 Marks)

A. Explain the main job and properties of insulators in power system and discuss the methods which can be used to improve the efficiency of insulator string. (5 Marks)

B. Describe the main components of overhead transmission. (3 Marks)

C. Each conductor of a three phase high voltage transmission line is suspended by a string of 4 suspension type disc insulators. If the potential difference across the second unit from the top is 13.2 Kv and across the third from top is 18 Kv. Determine the voltage between conductors and string efficiency. (12 Marks)

Q3:

(20 Marks)

- A. State the advantages of using DC link in interconnected power system. (3 Marks)
- B. A distributor AB is fed from both ends. At the feeding point A the voltage is maintained at 235 V and at B 236 V. The total length of feeder is 200 meters and loads are tapped, 20 amperes at 50 meters from A, 40 amperes at 75 meters from A, 25 amperes at 100 meters from A and 30 amperes at 150 meters from A. The resistance per 1000 meters of one conductor is 0.4 ohm. Calculate the current in various sections of the feeder, the minimum voltage and the point at which it occurs in the system, draw the voltage distribution over the feeder. (10 Marks)
- C. In a 500/250 dc 3-wire system there is a current of 1200 amperes on the positive side and 1000 amperes on the negative side and a motor load of 200 Kw across the outers. The loss in each balancer machine is 5 Kw. Calculate the current in the main machine and the load on each balancer machine. (7 Marks)

Q4:

(25 Marks)

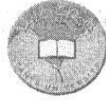
- A. Derive an expression for the value and the location of maximum sag when supports of transmission line are at unequal levels. (5 Marks)
- B. A 2 - wire feeder OAB has loads of 100 amperes at B and 50 amperes at A both at power factor 0.8 lagging. The impedance of OA is $(0.5+j0.1)$ ohm and that of AB is $(0.1+j 0.15)$ ohm. If the voltage at the far end "B" is maintained at 400 V. Find the voltage at "A" and at the supply end "O". Consider that the power factors are with respect to the voltages at the load points. (10 Marks)
- C. The towers of height 30 meters and 90 meters support transmission line at water crossing. The horizontal distance between the towers is 500 meters. If the tension in the conductor is 1600 kg. Find the minimum clearance between the conductor and water and the clearance mid-way between the supports. The weight of conductor is 1.5 kg/m. Bases of the tower can be considered at the water level. (10 Marks)

WISH YOU ALL THE BEST

Dr. Ayman Hoballah

إنتهت الأسئلة

End of Exam: Page 2/2



Final EXAM 2012/2013 - First Term

Course	Energy Conversion (EPM2106)	Time Allowed	3 hours
Students	2 nd Year (Electrical Power and Machines)	Total Mark	90
Date	Sun. 13 rd January, 2013	Number of pages	4

تعليمات عامة

1. تجنب تماما استخدام اللونين الأحمر والأخضر في إجاباتك.	2. لا تستخدم سائل التصحيح corrector إلا في أضيق الحدود.
3. تجنب قدر المستطاع استخدام القلم الرصاص فيما سوى الرسومات التوضيحية.	4. يراعى قدر المستطاع أن تبدأ إجابة كل سؤال في صفحة جديدة.
5. اكتب رقم السؤال بوضوح ولا يشترط الإجابة بترتيب الأسئلة في ورقة الامتحان.	6. أجب بوضوح سواء باللغة الإنجليزية أو العربية.

Attempt ALL the following questions and problems:

- Clarify your answer with the suitable illustrations with complete data as you can.
- Assume any missed data reasonably.

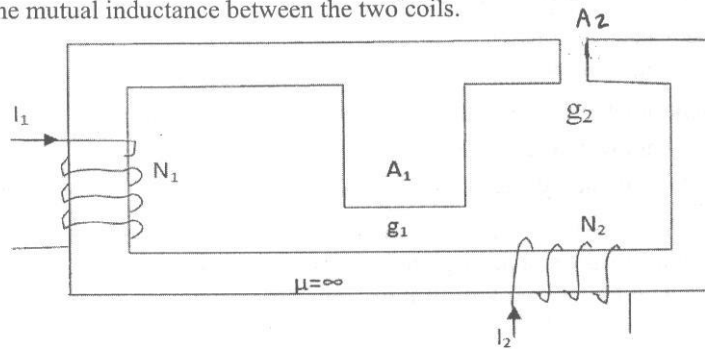
The First question 10 (marks)	
Which of the following statements is correct? <i>Only Write down</i> in your answer sheet the question number followed by either ✓ or X mark.	
1.	The B-H relation is nonlinear for non-magnetic materials.
2.	Inductance of a coil increases with increase in magnetic reluctance of its core.
3.	For a linear magnetic system, coil inductance does not depend on its current
4.	Mutual inductance between two coils depends on their self inductances
5.	The mutual inductance between two magnetically coupled coils MUST BE lower than the smaller self inductance of each coils
6.	Electromechanical energy conversion is possible in doubly excited rotating system with cylindrical (no-salient) stator and rotor
7.	For a nonlinear magnetic system, stored energy and coenergy are equal
8.	Direction of developed electromechanical torque tends to increase reluctance.
9.	Distributed winding provides more sinusoidal mmf space variation
10.	Renewable sources of energy have low running cost.

Please Turn Over

The Second question (15 marks)	
Choose the correct answer/answers for the following statements. <i>ONLY Write down</i> the question number followed by your choice/choices in your answer sheet:	
1.	Materials of higher magnetic permeability have A) higher inductance B) more flux leakage C) lower inductance D) lower iron losses
2.	Iron losses depend on A) electric supply frequency only B) area of hysteresis loop of the material only C) flux level only D) all the of the above choices
3.	Compared with magnetic materials, permanent magnetic material has higher values of A) magnetic field intensity (H) B) relative permeability (μ_r) C) flux density (B) D) current
4.	Mutual inductance between two coils increases with increase of: A) angle between their axes B) their currents C) distance between them D) none of the above choices
5.	For mutually coupled coils, if currents are both entering at the dot-marked terminals, coil fluxes A) are additive B) increase C) are subtractive D) cancel each other
6.	For ideally coupled coils, coupling coefficient is A) zero. B) unity C) infinity D) between zero and unity
7.	A rotating system with ac excitation for stator and dc excitation for the rotor is called a A) reluctance machine B) induction machine C) synchronous machine D) dc machine
8.	A two-phase winding excited from a two-phase gives A) a single rotating mmf B) stationary mmf C) two rotating mmfs with anti-direction D) Pulsating mmf.
9.	Conventional fossil sources of energy has the advantage of A) low running cost B) safe operation. C) economically feasible D) continuous availability forever
10.	The most effective quantity on the available mechanical energy at shaft of a wind turbine is: A) air density B) wind speed C) turbine diameter D) turbine power coefficient

Please Turn Over

The third question (20 marks)	
1.	Discuss what is meant by magnetic flux leakage and fringing in the magnetic circuits; then show how to minimize each of them. (4 Marks)
2.	With the aid of BH curve of a permanent magnet material show : (5 Marks) a) the effect of air gap length on the position of the operation point b) the point of maximum energy product
3.	Explain the dot convention employed to determine the polarity of the mutually induced voltages. Then show how it can be determined experimentally. (5 Marks)
4.	A system of two coils on an ideal core is shown in figure. $N_1 = N_2 = 500$ turns $A_1 = 2A_2 = 1000 \text{ mm}^2$ $g_1 = 2g_2 = 4 \text{ mm}$. Calculate (6 Marks) a- The self inductance of coil 1. b- The self inductance of coil 2. c- The mutual inductance between the two coils.



The fourth question (25 marks)	
1.	For a doubly-excited electromechanical energy conversion device of cylindrical stator and rotor: a) Sketch the space variation of self and mutual inductances. (3 marks) b) Derive a general expression for the electromagnetic torque acting on the rotor. (5 marks)
2.	With the aids of current-flux linkage curves, derive how to determine energy converted into mechanical motion from a certain position to another. (5 marks)
3.	For an electro-mechanical translational energy conversion system, derive an expression for developed force in terms of coenergy . (5 marks)

Please Turn Over

4.	<p>A rotating system has saliency in both stator and rotor. Self and mutual inductances varies with position θ as follows:</p> <p style="padding-left: 40px;">Stator self inductance $L_{11} = (3 + \cos 2\theta) \cdot 10^{-3}$ H</p> <p style="padding-left: 40px;">Rotor self inductance $L_{22} = 30 + 10 \cos 2\theta$ H</p> <p style="padding-left: 40px;">Mutual inductance $M = 0.1 \cos \theta$ H</p> <p>For $i_1 = 1$ A and $i_2 = 0.01$ A:</p> <p>a) Derive an expression for torque as a function of position θ (3 Marks)</p> <p>b) Sketch torque variation with position. (2 Marks)</p> <p>c) Find a position for maximum torque. (2 Marks)</p>
----	---

The fifth question (20 marks)	
1.	<p>Show the MMF space distribution a dc-excited coil of uniform air gap, if the conductors are:</p> <p style="padding-left: 40px;">a) concentrated b) distributed in 8 slots (4 in each side).</p> <p>Which of the two cases are preferred? Why? (5 Marks)</p>
2.	<p>Show that balanced three-phase windings excited by balanced three-phase currents produce a single rotating MMF wave. (4 Marks)</p>
3.	<p>Only using suitable diagrams of sufficient data, show the following:</p> <p style="padding-left: 40px;">a) A photovoltaic generating system. (3 marks)</p> <p style="padding-left: 40px;">b) A wind-energy-based electric generating system. (3 marks)</p>
4.	<p>A 1250 kVA, 3.3 kV, 50 Hz, 300 rpm, three-phase star connected generator has 180 slots and 5 conductors per slot having single layer winding with full pitch coils and one circuit per phase. Determine the specific electrical and the specific magnetic loadings if the air gap diameter of alternator is 2.2 m and axial length is 0.5 m. Assume phase spread of 60°. (5 Marks)</p>

Good Luck and best wishes
Prof. Essam Eddin M. Rashad
Dr. Abd Elwahab hassan

Course title: **Civil Engineering** Course code: **CSE2155** Second Year : **First Term**Date: **January 22, 2013**Allowed time: **3 hours**No. of pages : **(2)****السؤال الأول (13 Marks):**

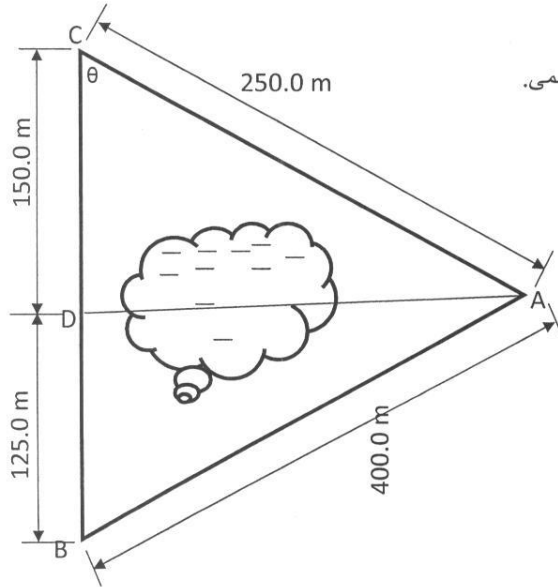
- أ- صمم وارسم مقياس رسم تخطيطي ١ : ٩٠٠٠ يقرأ مباشرة إلى اقرب ٢٠,٠ قسبة . ثم ارسم أوضاع الفرجار لتعيين الطول في الطبيعة المقابل لطول خط في الخريطة = ٨,٤ سم .
- ب- عند قياس مساحة قطعة ارض باستخدام شريط طوله ٢٠ متر كانت المساحة تساوي ٧٥٢٠ ياردة مربعة وكانت نسبة الخطأ في المساحة تساوي ٣% احسب المساحة الحقيقية للأرض. وإذا تم استخدام نفس الشريط لقياس مساحة قطعة ارض أخرى فكانت ٢ هكتار ، احسب النسبة المئوية للخطأ في مساحة قطعة الأرض الثانية.

السؤال الثاني (20 Marks):

- أ- قيس خط علي المائل فكان طوله مساويا ١٠٠ متر فما هو أقصى معدل انحدار بين منسوب طرفيه حتى يمكن اعتبار أن القياس علي ارض مائلة يعادل القياس علي ارض أفقية بخطأ نسبي لا يتجاوز ١ : ٢٠٠؟ وإذا كانت زاوية ميل سطح الأرض ضعف القيمة المحسوبة ، فما هو مقدار الخطأ النسبي في هذه الحالة؟.

- ب- عند عمل رفع لبركة مياه أحيطت بمثلث ABC أطوال أضلاعه كالآتي: $AB = 400.0 \text{ m}$ ،

أخذت النقطة D علي الخط BC بحيث كان طول $BD = 125.0 \text{ m}$ ، $CD = 150.0 \text{ m}$ احسب طول الخط AD إذا كان:



١. طول الشريط المستعمل صحيح (٢٠,٠ مترا).

٢. الشريط المستعمل ينقص ٢٠ سم عن طوله الأسمى.

ت - قيس خط بين نقطتين علي مستوي انحداره ١ : ٥ فوجد أن طوله ١٠٩,٢٥ متر علما بأنه كان هناك ترخيم في منتصف الشريط لكل طرحة مقدار ه ٢٠ سم ، وبعد إتمام القياس اختبر الشريط فوجد أن طوله ينقص بمقدار ١١ سم عن طوله الاسمي وهو ٢٠ مترا فما هو الطول الذي يعين به هذا الخط علي خريطة مرسومة بمقياس ١ : ٥٠٠ .

السؤال الثالث (12 Marks):

تم تثبيت مجموعة من الأوتاد علي محور طريق يراد إنشاؤه وذلك كل ٥٠ متر بحيث تكون رؤوسها علي منتظم إلي أسفل بمعدل ١ : ٢٥٠ من منسوب (٦٠,٧٠) ، وبعد فترة زمنية طويلة اشتبه في أن بعض الأوتاد قد اختلفت من أماكنها وللتحقق من صحة مناسيب الأوتاد أجريت ميزانية علي رؤوسها فكانت القراءات التالية:

١,٧٩ - (٠,٨٧) - ٢,٥٩ - (١,٤٨) - ١,٩٨ - ١,٢٤ - ١,٢٩ - ١,٥٦ - ١,٨٤ - ٢,٠٤ - ٣,٢٨ - (٢,٥٤) - ٠,٨٣ - ١,٠٧ - ١,١٣ - ١,٥٨ - (١,٣٠) - ٠,٧٦ - (١,٧٤).

علما بان الميزان قد رفع بعد القراءات التي بين الأقواس ، وكانت القراءة السادسة مأخوذة علي الوند رقم (١) ثم توالى القراءات علي الأوتاد حتى القراءة السادسة عشرة ، وكانت القراءة الأولى والأخيرة مأخوذة علي روبيرين منسوبهما (٥٧,٩٣) ، (٥٧,٩٥) مترا علي التوالي . والمطلوب:

- تدوين الأرصاد السابقة في جدول ميزانية وحساب مناسيب النقط مع عمل التحقيقات الحسابية اللازمة.
- تعيين أرقام الأوتاد المختلة وحساب قيمة الخطأ في مناسيبها.

With the best of wishes.....

examiners: *Dr. Sobhy A. Younes*

← باقي الامتحان في الورقة الثالثة



الورقة الثانية (25 درجة)

السؤال الأول:- (9 درجات)

- أ- عرف التربة موضعا كيف تكونت؟ (1.5 درجة)
- ب- ماهي أهم الفروق بين التربة المتماسكة والتربة الغير متماسكة؟ (1.5 درجة)
- ت- أذكر بعض أنواع التربة ذات المشاكل موضعا الاضرار التي تسببها للمنشآت. (1.5 درجة)
- ث- أذكر باختصار أهم أسباب تولد الاجهادات داخل التربة. (1.5 درجة)
- ج- ما هي أهم الشروط التي يجب أن تتحقق في الأساسات لضمان سلامة المنشآت. (1.5 درجة)
- ح- أذكر أهم الطرق المتبعة في تنفيذ الخوازيق. (1.5 درجة)

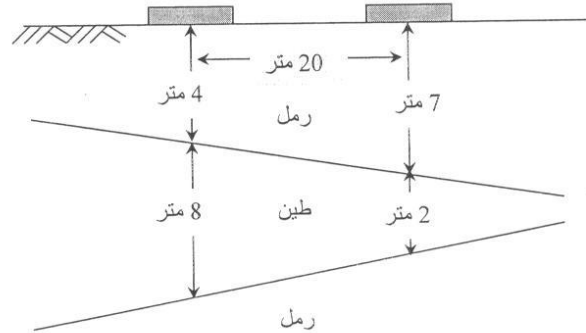
السؤال الثاني:- (10 درجات)

وضح بالرسومات المتقنة وكافة البيانات على الرسم كلا مما يأتي:

- خ- دورة انتقال الأحمال من المنشأ الى التربة. (2.5 درجة)
- د- تأثير أبعاد الأساسات على العمق الذي تنتزع خلاله الاجهادات في التربة. (2.5 درجة)
- ذ- التوزيع المثلى لمكونات التربة في الحالة الجافة والمشبعة والغير مشبعة. (2.5 درجة)
- ر- بعض الأسباب التي تؤدي لحدوث ظاهرة الهبوط النسبي في المنشآت. (2.5 درجة)

السؤال الثالث:- (6 درجات)

- أ- "الهبوط الكلي أكثر خطورة على المنشأ من الهبوط النسبي" تحقق من صحة هذه العبارة مع التعليل ثم أذكر قيم الهبوط المسموح بها للأساسات طبقا للكود المصري لتصميم الأساسات. (2 درجة)
- ب- تركز قاعدتي برجين من أبراج الكهرباء على طبقة من الرمل تليها طبقة من الطين القابل للانضغاط ثم طبقة أخرى من الرمل كما هو موضح بالشكل التالي، وكانت المسافة بين منتصف القاعدتين 20.0 متر وأبعاد كل قاعدة 4.0*4.0 متر، وكل قاعدة تنقل اجهادا مباشرا للتربة أسفلها مقداره 15.0 طن/م². المطلوب حساب قيمة الهبوط النسبي بين منتصف القاعدتين نتيجة انضغاط طبقة الطين اذا علمت أن معامل التغير الحجمي لطبقة الطين ($m_v = 0.004 \text{ m}^2/\text{ton}$) (4 درجة)



أطيب الأمنيات بالنجاح والتفوق
د. أحمد فاروق

Answer the following questions:

Question (1) (16 Marks)

- a) Using cylindrical coordinates, derive an expression for the electric field intensity E due to an infinite sheet of uniformly distributed charge with density ρ_s C/m². (6 Marks)
- b) A circular ring of radius a carries a uniform charge ρ_L C/m placed on the xy -plane with its axis along the z -axis. (10 Marks)
 - 1- Find E at $(0, 0, h)$.
 - 2- If two identical point charges Q are placed at $(0, a, 0)$ and $(0, -a, 0)$ in addition to the ring, find the value of Q such that $E = 0$ on z -axis.

Question (2) (16 Marks)

- a) State (without proof) the divergence theorem. How can you use this theorem to get the continuity equation of current? (6 Marks)
- b) A uniform line charge of 30 nC/m is located on the z -axis, and a uniform volume charge density of 100 μ C/m³ is located in the cylindrical region $2 < \rho < 3$ cm around z -axis. Find D everywhere. (10 Marks)

Question (3) (18 Marks)

- a) Derive the boundary conditions at the interface between a conductor and a dielectric. (4 Marks)
- b) If $E = y a_x + x a_y + 2 a_z$ V/m, find the work done in carrying a point charge of 2 C along the straight line path from: (7 Marks)
 - 1- A(1, 0, 1) toward B(0.8, 0.6, 1).
 - 2- B(0.8, 0.6, 1) toward A(1, 0, 1).
- c) Two concentric spherical conductors with the inner conductor of radius 2 cm and the outer conductor of internal radius 6 cm as shown in Figure 1. Two layers of dielectric materials fill the space between the two conductors. The inner layer has a relative permittivity of $\epsilon_{r1} = 2$ and thickness of 1 cm, while, the outer layer has a relative permittivity of $\epsilon_{r2} = 3$. Find the capacitance C . Derive any expression used. (7 Marks)

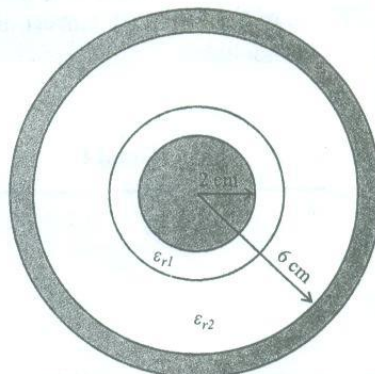


Figure 1

Question (4) (19 Marks)

- a)
- Use ampere's circular law to find out H and B inside an infinite long straight non-magnetic conductor whose centre line is along the z -axis and of radius a meters carrying a uniform current density of $J \text{ A/m}^2$. (7 Marks)
 - Show that $\nabla \times \vec{H} = J$. (3 Marks)
 - Find the total magnetic flux crossing the surface defined by:
 $z = 0 ; \frac{a}{40} \leq r \leq \frac{a}{2} ; \pi \leq \varphi \leq 2\pi$ (3 Marks)

- b) Consider a semicircular conducting wire of radius a , carrying a current I , with its centre at the origin as shown in Figure 2. Given a magnetic flux density $\vec{B} = B_1 \vec{a}_\phi + B_2 \vec{a}_z$ Tesla, find the total force acting on the wire. (6 Marks)

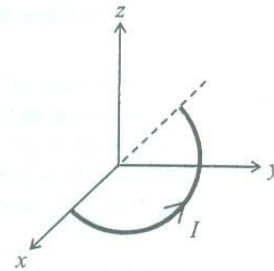


Figure 2

Question (5) (16 Marks)

- a) Two neighbour telephone circuits A and B situated in air in one plane as shown in Figure 3. Determine the mutual inductance per unit length between the two circuits A and B.

(10 Marks)

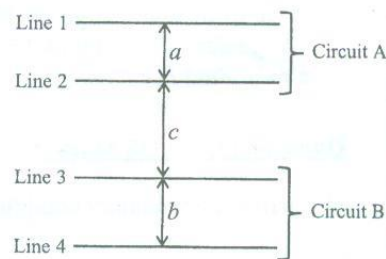


Figure 3

- b) In a material whose conductivity is σ mho/m and relative permittivity is ϵ_r , the electric field varies with time t as $A \sin \omega t$. Find the densities of conduction current and displacement current in A/m^2 and the frequency at which they have equal magnitudes. (6 Marks)

Good Luck

Assoc. Prof. Ahmed I. Shobair
Dr. Diaa-Eldin A. Mansour



University of
Tanta

Department of
Engineering Physics and Mathematics

Faculty of
Engineering



Final Exam 2012/2013 - First Term

Course : Engineering Mathematics(A) (PME2109)

Time Allowed : 3 Hours

Students: 2nd Year (Electrical Power and Machines)

Total Mark : 85

Date : Sunday, January 20th, 2013

Number of Pages: 2

Answer The following Questions

The First Question

Find the root correct to three decimal places of the equation $x e^x = \cos x$ using fixed point method. (12 marks)

The Second Question

A third degree polynomial passes through the points (0,-1), (1,1), (2,1) and (3,2),
find $f(1.5)$ using Lagrange's interpolation. (12 marks)

The Third Question

Evaluate the integral $I = \int_0^2 \frac{x^2+2x+1}{1+(x+1)^4} dx$ by Gauss three point formula. (12 marks)

The Fourth Question

For the initial value problem $y' = (1 + x^2)y$, $y(0) = 1$, $h = 0.1$ for $x \in [0, 0.4]$.

- a - Solve using Milne's predictor –corrector method. (4 marks)
 - b - Compute the starting values using fourth order Runge-Kutta method. (4 marks)
 - c - Compare the numerical solution with the exact solution at the nodal points. (4 marks)
-
-

The Fifth Question

For the boundary value problem $y'' + 5y' + 4y = 1$, $y(0) = y(1) = 0$,

a - Solve by finite difference method using central difference approximations with mesh length $h = 0.25$. (8 marks)

b - Find the exact solution. (2 marks)

c - Find the absolute errors at the nodal points. (2 marks)

The Sixth Question

Solve the Laplace equation $u_{xx} + u_{yy} = 0$, for the square mesh $[0,1] \times [0,1]$, under the boundary conditions $u(x,0) = 2x$, $u(0,y) = -y$, $u(x,1) = 2x - 1$ and $u(1,y) = 2 - y$ using finite difference method and Gauss-Seidel iteration with mesh length $h = 1/3$. Obtain the results correct to three decimal places. (13 marks)

The Seventh Question

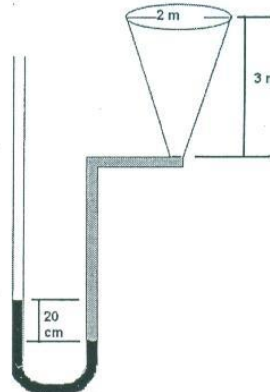
Find the numerical solution of the heat equation $4u_t = u_{xx}$, $0 \leq x \leq 1$ subject to the conditions $u(x,0) = 3x$ for $x \in [0, \frac{1}{2}]$ and $3(1-x)$ for $x \in [\frac{1}{2}, 1]$, $u(0,t) = u(1,t) = 0$ using Crank-Nicolson method with step length $h = 0.25$ and time step $k = 1/32$. Integrate for two time steps. (12 marks)

Good Luck and Best Wishes

Dr. Mohamed Elborhamy

Final Term Exam January 2013

- 1- The Figure shows a conical vessel having its outlet at A to which U-Tube manometer is connected. The reading of manometer given in the Figure is for the condition when the vessel is empty. Find the reading of manometer when the vessel is completely filled with water.

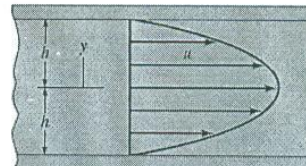


- 2- Automobile engine that operates on four-stroke engine produced brake power 94 kw at speed 2000 rpm, number of cylinder 6 cylinder, cylinder diameter 80 mm, stroke length 108 mm.
Calculate:
a- Stroke volume
b- Engine capacity
c- Brake mean effective pressure
d- Torque.
- 3- Find the critical radius of insulation for a pipe with radius 3.5 cm surrounded by asbestos ($k= 0.181 \text{ w/m.}^\circ\text{C.}$) and exposed to air at a temperature of 10°C with $h= 3.5 \text{ w/m}^2 \text{ }^\circ\text{C.}$ Also, find the heat losses from the pipe at 275°C for the following cases:
a- Pipe with critical radius of insulation.
b- Pipe without insulation.
c- Pipe with critical radius of insulation + 1.5 cm thick insulation.
d- Pipe with critical radius of insulation - 1.5 cm thick insulation.

Also plot the values of Q/L versus radius for each case.

- 4- a) Discuss the boiler classification -
4-b) The velocity distribution for the flow of a Newtonian fluid between two wide, parallel plates is given by the equation

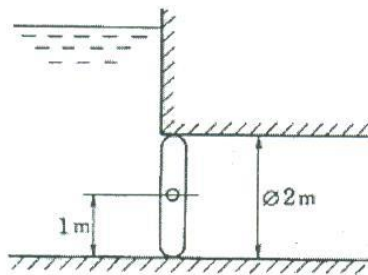
$$u = \frac{3V}{2} \left[1 - \left(\frac{y}{h} \right)^2 \right]$$



Where V is the mean velocity. The fluid has a viscosity of 0.04 pa. s . When $V = 2 \text{ m/s}$ and $h = 0.1 \text{ m}$ determine: (a) the shearing stress acting on the bottom wall, and (b) the shearing stress acting on a plane parallel to the walls and passing through the centerline (mid plane)

5- A centrifugal pump deliver $0.2 \text{ m}^3/\text{s}$ discharge of the water from suction reservoir in to delivery reservoir. The static suction head 5 m below the atmospheric pressure and static delivery head 18 m above the atmospheric pressure. Diameter of suction and delivery pipe is 20 cm and length of suction pipe 5.5 m and length of delivery pipe is 20 m . the friction factor of pipe material 0.04 . Determine the shaft power input to the pump. Given pump efficiency 0.86 .

6- As shown in Fig. a circular water gate, diameter 2 m , is supported by a horizontal shaft. What is the moment around the shaft to keep the water gate closed?



With my best wishes

Prof Dr abd elnaby kabeel