Tanta University
Department: Elec. Power and Machines Engineering
Total Marks: 90 Marks

Faculty of Engineering

Course Title: Electric circuit (1)	Course Code: EPM1101	Year: 1st
Date: 10/1/2013 (First term)	Allowed time: 3 hrs	No. of Pages: (2)

Remarks: (answer the following questions... assume any missing data... answers should be supported by sketches...etc)

Answer All The Questions

The first question (20 Degrees)

a) For the circuit shown in Fig. (1) Find :

I_L , V_{C1} , V_{C2} ,& P_s

b)For the circuit shown in Fig. (2) Find :

R_t ,I_s , I_1& V_1

The second question (25 Degrees)

a) For the circuit shown in Fig.(3) :
Use node voltage method to find V_x

b) For the circuit shown in Fig.(4) :
Find the instantaneous capacitor voltage (v_c) & sketch it

The third question (25 Degrees)

a) For the circuit given in Fig (5) , Find Z_L , that will absorb maximum power & calculate this maximum power & also the power factor .

b) For the circuit given in Fig(6)

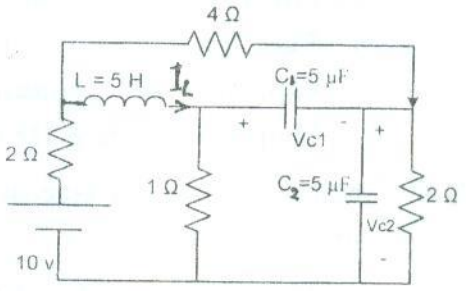

Fig. (1)

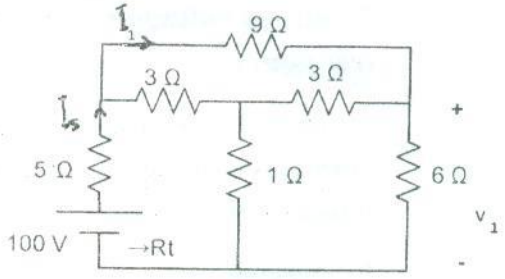

Fig. (2)

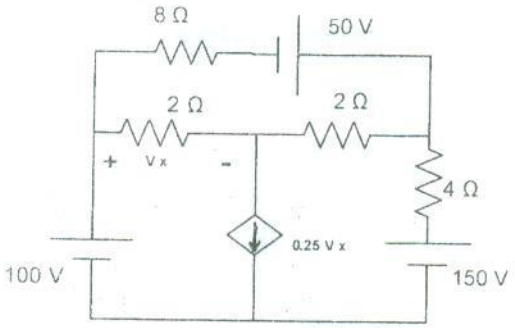

Fig .(3)

i)Sketch the power Triangle & find input power factor & I_s.

ii)The value of capicator which must be connected to improve the power factor to unity .

The fourth question (20 Degrees)

a) For a series resonant circuit of Fig (7) i) Find the circuit capacitor for resonance frequency of 50 KHz & coil resistance for circuit quality of 10

ii) The circuit band width.

iii) The minimum output voltage & output voltage at cut off frequency.

iv) Sketch the output voltage versus frequency & what is the name of this filter.

b) Determine the admittance parameters of the circuit shown in Fig.(8) ;and draw its equivalent circuit .

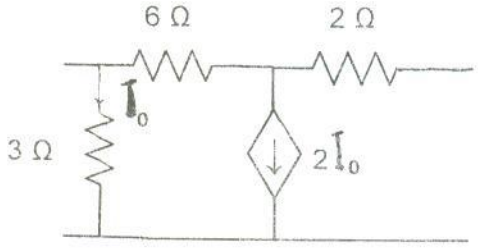

Fig.(8)

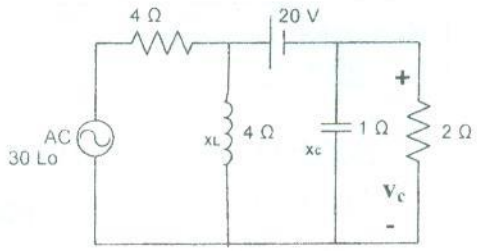

Fig. (4)

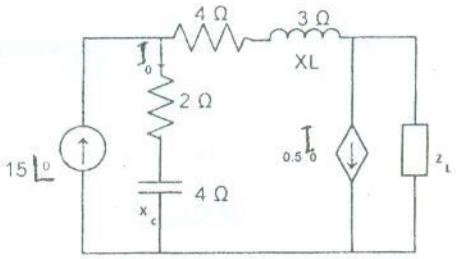

Fig.(5)

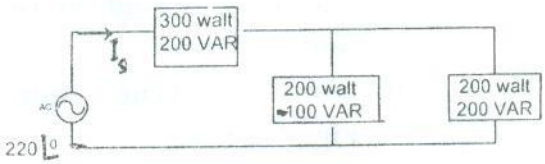

Fig.(6)

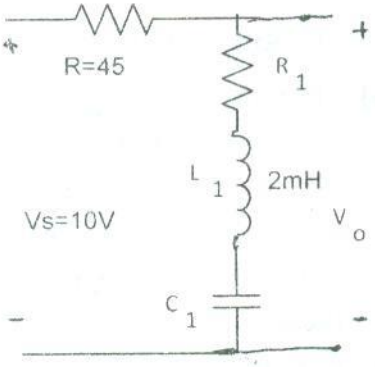

Fig.(7)

Good luck

Tanta University | Physics & Engineering Mathematics Department | Faculty of Engineering

Total Marks: 95 Marks

Course Title: Engineering Mathematics (2) a — First Year (Electrical Engineering)
Course Code: PME1106 — Date:13 / 1 / 2013 (First term) — Allowed time: 3 hrs — No. of Pages: (2)

Remarks: (Answer the following questions. Assume any missing data…)

Problem number (1) (10 Marks)

(a) Find the domain of the function $Z = \sqrt{(x-1)(y+2)}$, give a sketch for the domain region.

(b) Let $Z = x^2 - y^3$, $x^2 - u^2 = y^3 - Lnv$ and $y^2 + Lnv = u + x^3$, find $\frac{\partial Z}{\partial u}$.

(c) Given $u = \tan^{-1}(\frac{y^2}{x})$, use Euler's theorem to prove that:

$$x^2u_{xx} + 2xyu_{xy} + y^2u_{yy} = -\sin 2u \sin^2 u .$$

Problem number (2) (14 Marks)

(a) Find the dimensions of a rectangular tank whose volume is 32 m^3 and the sum of the surface area of the base and the vertical walls is minimal.

(b) Find Maclurine series of $f(x,y) = ye^{x^2+y}$.

(c) Find the envelope of the straight line $\frac{x}{a} + \frac{y}{b} = 1$, which is moving and makes with the two axes x, y a triangle with constant area C .

(d) If $\int_0^\infty e^{-ax}\,dx = \frac{1}{a}$, prove that $\int_0^\infty x^n e^{-ax} dx = \frac{n!}{a^{n+1}}$.

Problem number (3) (14 Marks)

(a) Find the work done by the force field $F = x^3y\,\underline{i} - x\,\underline{j}$ in moving an object along the circle, $x^2 + y^2 = 1$ in the counter clockwise direction.

(b) Verify Green's theorem for the integral $\oint_C (x^2 + y^2)\,dx - 2xydy$, where C is the rectangle in the xy plane bounded by $y = 0$, $x = 0$, $y = b$, $x = a$.

(c) Evaluate the integral, $\int_0^\infty \int_y^\infty \frac{e^{-x}}{x} dxdy.$

(d) Find the volume bounded by $Z = 16 - x^2$, $x = 0$, $y = 6$, $Z = 0$, $y = 0$.

Problem number (4) (47 Marks)

(a) Solve the following first order differential equations:

1) $(\sin y)\, y' = \cos x\,(2\cos y - \sin^2 x)$

2) $y = 2xy' - yy'^2$

P.T.O. ⟶

3) $(y + xy^2)dx + (x - x^2y)dy = 0$, assume that the integrating factor which is a function of (xy)

4) $(4x + 3y + 2)dx + (3x + 2y + 1)dy = 0$.

(b) Derive the general solution of the O.D.E. $a_n y^{(n)} + a_{n-1}y^{(n-1)} + a_{n-2}y^{(n-2)} + \cdots + a_0 y = f(x)$, where $a_n, a_{n-1}, a_{n-2}, \ldots, a_0$ are constants, using the **method of variation of parameters.**

(c) Solve the following D.E.'s :

1) $(D^3 - 1)y = x^5 + 5^x + 2\cos x \cos 3x$

2) $y'' - 3y' + 2y = e^{2x}(1 - e^{2x})^{-1}$

3) $x^2y'' - 2xy' + 2y = 2xLnx.$

(d) Find the current $I(t)$ of a simple *RLC* series circuit when $L = 20H, R = 80\Omega, C = 10^{-2}F$ connected in series to a variable power supply $E = 50\sin 2t$.

With my best wishes

Dr. Assem Elshenawy

Tanta University

Department: Computers and Automatic Control Eng.
Total Marks: 85 Marks

Faculty of Engineering

Course Title: **Fundamentals of Logic Design**	Course Code: **CCE1102**	Year: **1st Electrical**
Date: **Jan. 15th 2013 (First Term)**	Allowed time: **3 hrs**	No. of Pages: (2)

Remarks: Please Read the question more than once to fully understand it before you start solving, Do not forget to make verification and validation for your answers.

Problem number (1) (25 Marks)

a) Give one word for each of the following sentences, then explain each in details specially the diagrams and internal design:

1- **Device that is used to choose between different inputs to be outputted to a single line.**
2- **Memory device that is used to temporally store one bit of data.**
3- **Circuit that is used for deciding whether the two numbers equal or which is larger.**

b) Simplify the following functions into sum of products and product of sums:

1- $F1(A,B,C,D) = \sum(1,2,3,7,8,9)$
2- $F2(A,B,C,D) = \pi(0,2,4,6,7)$
3- $F3(A,B,C,D) = \sum(0,2,5,6,11,12,13)$, Don't care$(A,B,C,D) = \sum(1,3,15)$

Then choose the best of the two methods (sum of products and product of sums) to implement each of the functions and why?

Choose only three of the following questions. Only the first three answers will be corrected so choose wisely.

Problem number (2) (20 Marks)

a) Do as shown between brackets:

1- **Priority encoder and traditional encoder.** **(Compare in details)**
2- **D flip flop gives three functions: set, reset, complement.** **(Correct and explain)**
3- **Simplifying the logic circuit can reduce many factors.** **(State and explain these factors)**

b) Show how to implement 4-to-10 decoder using two 3-to-8 decoders. Draw the truth table of 4-to-10 decoder and show how to divide it to be suitable to use 3-to-8 decoders.

c) Implement the following function using 8-to-1 Mux then by 4-to-1 Mux.
$F(A,B,C) = \sum(1,2,4,6,7)$

Problem number (3) (20 Marks)

a) "Boolean algebra can produce poor simplification for the function" Explain why and use the following example of simplification to illustrate your answer. (Example: $F = ABC + ABC' + AB'C$ was simplified using Boolean algebra to be $F = AB + AB'C$)

b) Use a decoder to implement the following functions:

1- $F1(A,B,C,D) = \sum(1,2,4,6)$
2- $F2(W,X,Y,Z) = WX + X'YZ + WYZ'$
3- $F3(A,B,C) = \pi\,(2,4,5,6,7)$

c) Design a circuit that accepts 4 bit number and produces two outputs. The first one shows that this number is divisible by 3 while the other shows that this number is divisible by 5.

Problem number (4) (20 Marks)

a) State why:

1- We need enable line in the decoder.
2- Use demultiplexers.
3- Use control line (i.e. Clock pulse line) in the flip-flops.
4- 00 (or 11) is not used in RS flip-flop.

b) Encoder circuit suffers from two problems. What are they and how the designer can solve them? Use 4-to-2 encoder to show your answer.

c) Draw and explain the circuit that uses a Mux to choose one of 4-bit two words (A , B) to be entered to a 4-bit Full adder circuit. The second word entering the FAs is C which is also a 4-bit word.

Problem number (5) (20 Marks)

a) What is the purpose of decoders and Multiplexers? Draw the block diagram, function table and internal structure of 2-to-4 decoder and 4-to-1 Mux.

b) Draw the following two functions:

$F1 = ABC' + A'B' + AC$ $\qquad$ $F2 = A'(C'+D') + ABC$

Compute the time required to produce the output in each of the two circuits if you know that the gate delays are: AND gate = 5 ns, Or gate = 5 ns and NOT gate = 3ns.

Can you implement these circuits in another way that consumes less time and how.

c) What are the usage of registers and counters?

Good Luck

Course Coordinator: Assoc. Prof. Dr. Amany Sarhan

Tanta University

Department: Electronics & Comm. Engineering
Total Marks: 100 Marks

Faculty Faculty of Engineering

Course Title: Electronics (1)	Course Code: EEC1101	Year: First Year
Date: January 2013 (First term)	Allowed time: 3 hrs	No. of Pages: (2)

Remarks: (answer the following questions… assume any missing data… answers should be supported by sketches…etc)

Question number (1) (20 Marks)

1 (a) Choose the right answer :

1. In the active region the base-emitter junction is forward bias where as the collector-base junction is reverse bias ( ) *True* ( ) *False*
2. In the saturation region the base-emitter and collector-base junction are forward biased.
( ) *True* ( ) *False*
3. Line regulation is determined by changes in output voltage and input voltage
( ) *True* ( ) *False*
4. The diode peak current in a half wave rectifier, is directly proportional with the frequency of the input voltage . ( ) *True* ( ) *False*
5. If one of the diodes in a bridge full wave rectifier opens, the output is zero volt .
( ) *True* ( ) *False*
6. When a 60 Hz sinusoidal voltage is applied to the input of a full wave rectifier , the output frequency is 60 Hz
( ) *True* ( ) *False*
7. If a certain zener diode has a zener voltage of 3.6 V , it operates in avalanche breakdown.
( ) *True* ( ) *False*
8. For an operation of an amplifier, the base of an npn transistor must be positive with respect to the collector.
( ) *True* ( ) *False*
9. If I_C is 50 times larger than I_B then β is 500
( ) *True* ( ) *False*
10. When operated in cut off and saturation ,the transistor acts like amplifier.
( ) *True* ( ) *False*

(b) A diode operates in the forward bias region, if we wish to increase the diode current by 15 times . How much change in V_D is required.

(c) Determine the electron and hole drift velocities through a 5 μm piece of intrinsic silicon across which a voltage of 10 V is applied. Assume $\mu_n = 1359\ cm^2/V$ and $\mu_p = 480\ cm^2/V$

Question number (2) (20 Marks)

(a) (i) Explain the effect of reverse bias on the junction capacitance of a pn junction.
(ii) A pn junction is doped with $N_A = 10^{17}\ cm^{-3}$ and $N_D = {}^{16}\ cm^{-3}$. Determine C_{Jo} at zero reverse bias ,and the capacitance C_J at a reverse bias voltage of 2V . Discuss your results.
Given : $\varepsilon_{si} = 1.04 \times 10^{-12}$ F/cm , $q = 1.6 \times 10^{-19}$ C., $V_0 = 0.728$V

b) For the circuit shown in Fig.1, if the peak value of $v_I = 10$ V, sketch the output voltage v_o and determine its positive and negative peak values assuming ideal diodes.

P.T.O.

Question number (3) **(20 Marks)**

(a) (i) A 3V adaptor using a half wave rectifier must supply a current of 0.6A with a maximum ripple of 400 mV .For a frequency of 60Hz , determine the minimum required smoothing capacitor.

(ii) Sketch the circuit diagram of a voltage doubler and explain its operation.

(b) For the circuit shown in Fig.2, using constant voltage model (V_D =0.7V) , find the voltages and currents indicated.

Question number (4) **(20 Marks)**

(a) (i) Explain how a zener diode is used in voltage regulation.

(ii) A transistor with $I_S = 6 \times 10^{-16}$ A must provide a transconductance of 1/(13Ω) .What base-emitter voltage is required.

(b) Calculate the collector current of Q1 in Fig.3 , if $I_S = 3 \times 10^{-17}$ A

Question number (5) **(20 Marks)**

(a) Determine the operating point and the small signal model of Q1 for the circuit shown in Fig.4., Given: $I_S = 3 \times 10^{-17}$ A , $\beta = 100$, and $V_A = \infty$

(b) Determine the value of β that places Q1 at the edge of active mode in Fig.5.
Given: $I_S = 8 \times 10^{-16}$ A

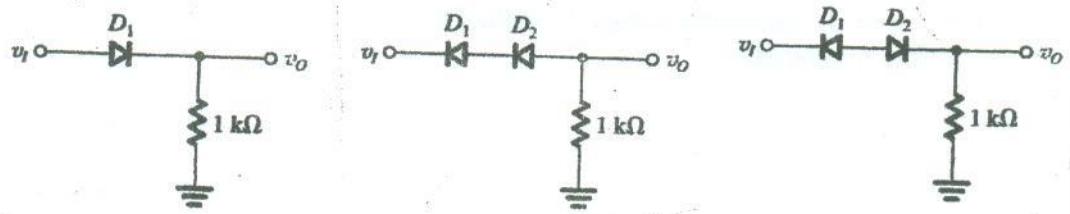

Fig.1

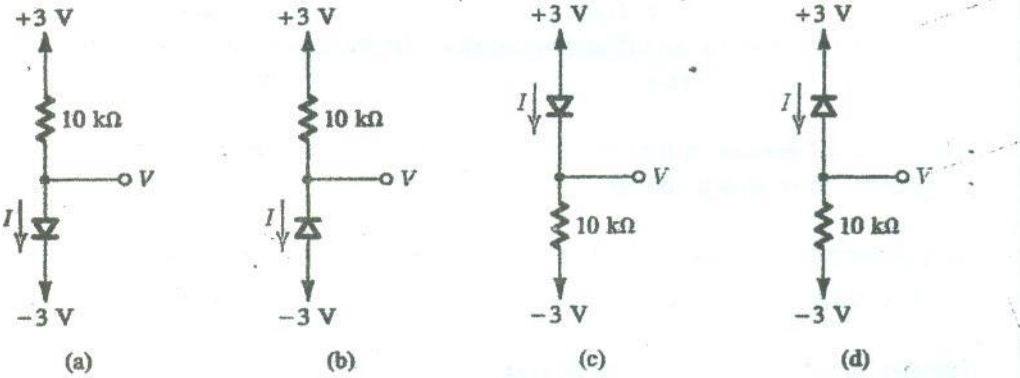

Fig.2

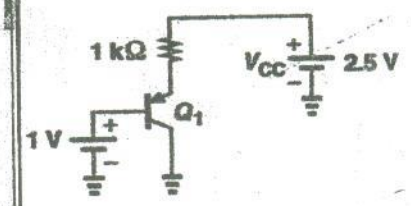

Fig.3

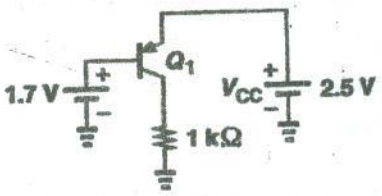

Fig.4

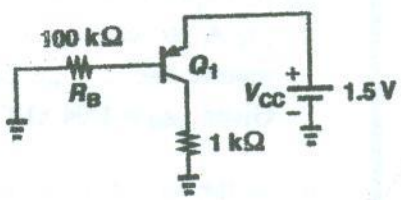

Fig.5

Good Luck Prof.Mustafa Mahmoud

Tanta University

Department: Elec. Power and Machines Engineering
Total Marks: 70 Marks

Faculty of Engineering

Course Title: Electrical and electronic materials	**Course Code: EEC/EPM1160**	**Year: First year**
Date: January 22nd 2013 (First term)	**Allowed time: 3 hrs**	**No. of Pages: (2)**

الإمتحان مكون من ٥ أسئلة فى صفحتين

Problem number (1) (14 Marks)

a) Rewrite the following sentences and complete the missing word: **(4 points)**

i) ... (1) ... have no enough free electrons and their electrons hold on tightly to atoms
ii) ... (2) ...polarization occurs in materials containing permanent dipoles that cannot rotate freely
iii) The minimum value of the real component of dielectric constant equals ... (3) ...
iv) The ... (4) ...losses depend on the maximum flux density in ferromagnetic materials

b) Decide if the following sentences are true or false. **(4 points)**

i) The value of μ_r for diamagnetic materials is slightly lower than 1.
ii) Dielectric materials cannot be subjected to 3 types of polarization at the same time.
iii) Piezoelectricity depends on the mechanical deformation of some crystals that have nonuniform charge distribution
iv) When the magnetic dipole moment is inserted inside a magnetic field, it will be subjected to a magnetic force.

c) Use the Clausius-Mossotti equation to calculate the dielectric constant for a dielectric having a number of molecules per unit volume of $4.425*10^{16}$ cm^{-3} and a polarizability of $3*10^{-34}$ F m^2. **(6 points)**

Problem number (2) (21 Marks)

a) Calculate the active and reactive power loss in a dielectric when subjected to an electric field of 120 kV/cm under a frequency of 50 Hz. The active and reactive values of the dielectric constant at this frequency are respectively: 2.5 and 0.015. What is the value of tangens delta under this condition? **(6 points)**

b) Compare between soft and hard magnetic materials and mention the main fields of utilization of each type. **(4 points)**

c) Describe the basic properties of superconductors showing the effect of temperature and flux density on their performance. **(4 points)**

d) Calculate the total loss per unit volume for a certain magnetic circuit at a frequency of 50 Hz. The lamination thickness is 0.5 mm and the resistivity of the core is 500 μΩ.m. Assume that the maximum magnetic flux density is 2.0 tesla and the coercive force is 0.02 A/m. How can you reduce the magnetic loss of this magnetic circuit? **(7 points)**

Problem number (3) (13 Marks)

a) If the silicon density equals 2.33 g/cm^3, its intrinsic concentration is $1.5 * 10^{10}$ cm^{-3}, $\mu_n = 1300\ cm^2/V.s$, $\mu_p = 500\ cm^2/V.s$, and its atomic weight equals 28.1, then: (8 Marks)

i. Using Avogadro's number ($6.022 * 10^{23}$), find the concentration of atoms.
ii. Find the resistivity of intrinsic silicon at 300°K.
iii. If a donor-type impurity is added to the extent of 1 part in 10^8 silicon atoms, find the resistivity.
iv. If the silicon were a divalent (i.e. two valence electrons) metal, find its resistivity.

b) Calculate the built-in voltage of a junction in which the *p* and *n* regions are doped equally with 10^{16} atoms/cm^3. Assume $n_i \simeq 10^{10}/cm^3$ and $\epsilon_s = 1.04 \times 10^{-12} F/cm$. With no external voltage applied, what is the width of the depletion region, and how far does it extend to into the *p* and *n* regions? (5 Marks)

Problem number (4) (10 Marks)

a) If a metal or a semi-conductor strip, which carries a current I in the x-direction, is placed in a transverse magnetic field B in z-direction. Show, using sketches and equations, that:

$$R_H = \frac{wV_H}{BI}, \text{ and } \mu = \sigma R_H$$

where μ is the mobility, σ is the conductivity, w is the strip width, V_H is the Hall voltage, and R_H is the Hall coefficient. (5 Marks)

b) A sample of Si has the dimensions (1mm x 1mm) area, and 1 cm length. The current flows along the length direction (x-direction). The magnetic field is in the z-direction. The Hall voltage, measured between the upper and lower surfaces is – 10 mV, current in x-direction is 10 mA, and the voltage in the x-direction is 1 V. The magnetic field is 1 Tesla. (6 Marks)

i. What is the type of conduction (n or p)?
ii. What is the mobility? And what is the carrier concentration?

Problem number (5) (12 Marks)

a) Draw only the *Czochralski* system for silicon crystal growth. (3 Marks)

b) The silver crystal has a cubic **FCC** structure. The atomic radius $r = 1.44\ A°$: (9 Marks)

i. Sketch one unit cell sample.
ii. Deduce the relation between the lattice constant ***a*** and ***r.***
iii. Calculate the atomic packing factor.
iv. Calculate the atomic planar density for the plane (011).
v. Calculate the atomic planar density for the plane (211).

Good Luck

Course Examination Committee

Dr. Salah Khames Dr. Ahmed Refaat

Dr. Ahmed Shobir

Tanta University

Department: **Computers and Control Engineering**
Total Marks: 60 Marks

Faculty of Engineering

Course Title: **Programming 1** برمجة الحاسب ١ أولي كهرباء Course Code: CCE1204 1st. year
Date: 24-1-2013 Allowed time: 3 hrs No. of Pages: (2)

أجب عن جميع الأسئلة الآتية:

السؤال الأول:

١- ما هي الشروط الواجب تحقيقها عند اختيار أسماء المتغيرات ؟

٢- أكتب المقدار الجبري الأتي بلغة سي ++ (C++) موضحاً ترتيب تنفيذ العمليات وقيمة المقدار علما بأن:
A = 1 , B = 10 , C = -11

$$Quantity = \log_{10}\left(\left| \frac{-B - \sqrt{|B^2 - 4AC|}}{2A} + \sin\frac{\pi}{2} \right| \right)$$

٣- اكتب برنامجا لحساب وطباعة الوسط الحسابي لمجموعة N من الأعداد الزوجية باستخدام حلقة DO بحيث:
*يتم إدخال العدد الأول NSTART والعدد الأخير NFINAL بطريقة المحادثة.
*المخرج يطبع منسقا مبينا عبارة وظيفة البرنامج والعدد الأول والعدد الأخير والمجموع والوسط الحسابي وعدد مرات التكرار.

السؤال الثاني:

١- يتم حساب فاتورة استهلاك المشتركين للغاز الطبيعي بشرائح حسب كمية الاستهلاك تبعا للتعريفة التالية :

الاستهلاك(Consumption)	التعريفة (Tariff)
30 ≥ Consum	0.10 E.P.
60 ≥ Consum > 30	0.20 E.P.
Consum > 60	0.30 E.P.

بالإضافة إلي مبلغ 1.75 E.P. مصاريف إدارية لكل فاتورة.
ارسم خريطة التسلسل وأكتب البرنامج لقراءة رقم المشترك و استهلاكه لعدد من المشتركين وحساب وطباعة فاتورة كل منهم تبعاً لما يلي:
يتم حساب عدد المشتركين الإجمالي و المبلغ الإجمالي وطباعتها في آخر التقرير.
لإنهاء البرنامج يتم تغذيته بعدد سالب.

Report of Consumption

Number ← ٢ مسافة → Consumption ← ٣ مسافات → Price
xxxxx xxx.xx xxx.xx

.....
Total Number of Consumers are xxxxx
Total Price is xxxxxx.xx E.P.

٢-اكتب و نفذ برنامجاً بلغة سي ++ (C++) لإدخال عدد صحيح وتحديد وطباعة إذا ما كان العدد أولي أم لا.
٣-كيف يمكن تمثيل حلقات While ، Until ؟ارسم خريطة التسلسل لكل منها وبين أي الحلقات تفضل ولماذا ؟

السؤال الثالث:

١- اكتب خوارزم وارسم خريطة التسلسل واكتب برنامجا بلغة سي ++ (C++) للإعلان عن مصفوفة أحاديه البعد مكونة من ٣٠ عنصرا ، يتم استقبال عناصر المصفوفة من المستخدم ثم إضافة عدد ثابت يتم إدخاله أيضا ، ثم يقوم البرنامج بطباعة المصفوفة الأصلية بترتيبها والمصفوفة بعد إضافة العدد الثابت إليها.

٢ – اكتب ونفذ برنامجا بلغة سي ++ (C++) يقوم بعمل تدوير (Transpose) لمصفوفة صحيحة مربعة على إن يقوم البرنامج بقراءة عدد الصفوف أو الأعمدة (بحد أقصى ٥٠) وقراءة بيانات المصفوفة من المستخدم بطريقة المحادثة ، ثم يقوم البرنامج بحساب ال (Transpose) وطباعة الناتج على هيئة صفوف وأعمدة.

٣- تحسب قوة الطرد المركزية لقطار سكة حديد نتيجة الحركة علي القضبان بالعلاقة التالية:

FORCE = WEIGHT x 200 x (SPEED x 1.4667)2 ÷ (32 x RADIUS)

حيث :

قوة الطرد المركزي بالباوند: FORCE ، وزن القطار بالطن : WEIGHT

سرعة القطار (ميل/ساعة) : SPEED ، نصف قطر منحني القضبان بالقدم : RADIUS

ارسم خريطة التسلسل وأكتب برنامجا لحساب قوة الطرد المركزي عند إدخال الوزن والسرعة ونصف القطر عدة مرات ولإنهاء البرنامج يتم تغذيته بنصف قطر سالب بحيث تكون المخرجات كالآتي:

Report of Centrifugal

RADIUS مسافة	SPEED ٣ مسافات	WEIGHT ٥مسافات	FORCE
xxx.xx	xxx.xx	xxxx.xxx	0.xxxxxxxESxx

السؤال الرابع:

١ - اكتب و نفذ برنامجاً بلغة سي ++ (C++) لإدخال عناصر مصفوفة صحيحة (٢٠ عنصر)عن طريق المستخدم، وطباعة عدد الإعداد الموجبة وعدد الإعداد السالبة وعدد الاصفرار في هذه المصفوفة .

٢ - ارسم خريطة التسلسل واكتب برنامجا لحساب مجموع حدود المتسلسلة الآتية إلى n حدا بحيث : يتم إدخال عدد الحدود المراد جمعها وكذلك قيم x بطريقة المحادثة.

$$e^{x} = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \ldots\ldots + \frac{x^n}{n!}$$

ويطبع تقرير بالشكل التالي :

Sum of xxxx Terms (at x = xx.xx) = S0.xxxxxxxESxx

٣- اكتب و نفذ برنامجاً بلغة سي ++ (C++) يقوم بترتيب قيم مصفوفة صحيحة ذات بعد واحد ترتيبا تنازليا، على أن يقوم البرنامج بقراءة عدد عناصر المصفوفة (بحد أقصى ٥٠) وبيانات المصفوفة من المستخدم بطريقة المحادثة، ثم يقوم بطباعة قيم المصفوفة بعد الترتيب.

مع أطيب الأمنيات بالتوفيق 💻 **ا.م.د./السيد سلام**