

Q1. Fill each of the following blanks:

1. The end point for Iodometric titrations is detected with -----.
2. The high equivalent to theoretical plate (HETP) is the ----- divided by -----.
3. pH meter is one of the ----- techniques.
4. 1 ppm of Li^+ = ----- mol/L Given that: atomic weight of Li = 6.94
5. Number of moles is computed as : no. of moles = -----
6. ----- is the milk sugar which is found in the milk of animals.
7. The compounds having a double bond are known as -----.
8. Primary alcohols are easily oxidized to -----.
9. Styrene is used for the manufacture of -----.
10. Nitration of naphthalene with a mixture of concentrated HNO_3 and H_2SO_4 yields ----- and -----.

(20 Marks)

Q2. A. How many grams per milliliter of NaCl are contained in a 0.25M solution.

Given that atomic weight of Na=23, Cl=35.5

B. How many grams ammonium chloride should be added to 3.0M sodium hydroxide and diluted to 500ml to prepare a buffer of pH = 9.5 with a salt concentration of 0.1M.

Given that: K_b for ammonia = 1.75×10^{-5} , molecular weight of ammonium chloride = 53.5

(20 Marks)

Choose either A or B

Q3. A. 0.2gm sample containing copper is analyzed iodometrically. Copper II is reduced to copper I by iodide.



what is the percent copper in the sample if 20ml of 0.1M $\text{Na}_2\text{S}_2\text{O}_3$ is required for titration of the liberated I_2 . Given that atomic weight of Cu = 63.5

B. Calculate the pH of a solution originally containing 50ml of 0.1M hydrochloric acid after the addition of 0ml, 15ml, 50ml, and 60ml of 0.1M sodium hydroxide.

(20 Marks)

Answer only two:

Q4. A. Give the general chemical formula of the following compounds.

a. alkene, b. thioalcohol, c. ethers, d. tertiary amine, e. carbohydrate.

B. Write the chemical equations for preparation of the following compounds:

a. Chloromethane from alcohol.

b. Tetraethyl lead from ethyl chloride.

(20 Marks)

Q5. A. Write the chemical structure for the following compounds:

a. polyethylene, b. tribromophenol, c. methylethyl ketone, d. benzofuran, e. aniline

B. What are the most important tests for characterizing a polymer.

(20 Marks)

Q6. A. Write the systematic names for the following compounds:

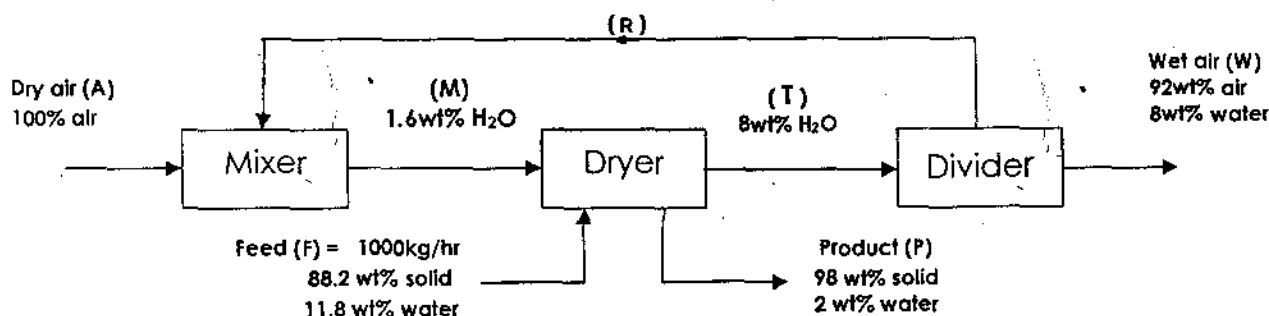
a. $\text{C}_{10}\text{H}_{22}$, b. $\text{C}_3\text{H}_7\text{COOH}$, c. CH_3Li , d. $\text{C}_6\text{H}_{12}\text{O}_6$, e. $\text{C}_2\text{H}_5\text{SH}$

B. What are the classes of carbohydrates? Write the name of one compound of each Class.

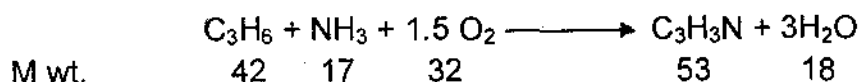
(20 Marks)

ملاحظة: اجب عن اربعة اسئلة فقط

Q1- A wet substance (F) consists of 88.2 wt% solid and 11.8 wt% water is continually fed to the dryer at a rate of 1000 kg/hr in order to obtain a product (P) containing 98 wt% solid using hot dry air (A). Part of the exit wet air is recycled to save energy as shown in the following flow diagram. Calculate the flow rates of all streams in the process with checking.



Q2- Acrylonitrile (C_3H_3N) is produced by propylene – ammonia oxidation reaction:



A gaseous mixture (F) consists of 10 mol% C_3H_6 , 15 mol% NH_3 and 75 mol% air is fed to the reactor at a rate of 100 lbmole / hr. The degree of completion of the reaction is 60%. The reaction products are passed through a condenser in which acrylonitrile and water are condensed and recovered as liquid product (P), and the rest are evolved as gases (G). Determine the limiting reactant & the excess reactants and calculate:

- % excess and % conversion for each of the excess reactants.
- mass flow rate and composition (wt%) of the liquid product (P).
- molar flow rate and composition (mol%) of the exit gases (G).

Note: Check the accuracy of calculation by computing total mass input and output.

Q3- A: A binary mixture of ethanol (C_2H_5OH) and ethyl acetate ($C_4H_8O_2$) with average molecular weight of 56.5. Calculate the composition of the mixture as mol% and wt%. Given that: atomic weight of C = 12 , H = 1 , O = 16 .

B: A small hydroelectric plant produces 20 MW when water flows at a rate of 100 m³/ sec from a height of 30 m above the generator. Calculate the efficiency of the plant. State the assumptions used in the solution.

Q4- Ethylene (C_2H_4) is fed to a heat exchanger at a rate of 10 mol/ sec so that it is heated from 40 °C to 100 °C by a hot 35 °API gas oil which flows at a rate of 0.5 kg / sec with inlet temperature of 130 °C. Calculate:

- a-the enthalpy change of ethylene in J/sec.
- b-the outlet temperature of gas oil assuming no change of its phase. .
- c-the volumetric flow rate of gas oil in m³/hr.

Given that: mean heat capacity of gas oil (C_{p_m}) = 2.15 kJ / kg °C.

heat capacity of ethylene is given by the following relation:

$$C_p = 40.75 + 0.115 T - 6.9 \times 10^{-5} T^2 \text{ where } C_p \text{ in J / mol. } ^\circ\text{C and } T \text{ in } ^\circ\text{C.}$$

Q5- A gaseous fuel consists of 75 mol% C_2H_4 and 25 mol% N_2 at 20°C and 340 psia (non-ideal behavior) is continuously fed to the furnace at a rate of 100 lbmole /hr so that ethylene is completely burned with 40% excess air. Calculate:

- a-volumetric flow rate of the fuel in ft³/hr using Kay's method and the generalized compressibility chart.
- b-lbmole of air required per hour.
- c-Orsat analysis of the flue gas.
- d-flow rate of the stack gas in lbmole/hr.

Given that:

Component	P_c , atm	T_c , K
C_2H_4	50.6	282.8
N_2	33.2	126

$$R = 10.73 \text{ psia. ft}^3 / \text{lbmole.} ^\circ\text{R} = 1.3145 \text{ atm. ft}^3 / \text{lbmole.K}$$

$$1 \text{ atm} = 14.7 \text{ psi.}$$

Q1: Read the following passage and answer (seven) questions only:

Because chemical plant equipment is so different from that used in the laboratory, one of the major jobs of R&D engineers is to decide what kinds of equipment must be used to carry out a commercial chemical process. They also determine the sizes of equipment needed. Before designing the full-sized plant, the R&D engineer usually constructs a pilot plant, actually a small model of the final plant, containing small versions of the equipment. Pilot plants are particularly useful when designing continuous process plants which are so different from the research laboratory. A continuous process pilot plant will usually run twenty four hours a day with three or four groups of operators and engineers, each group working for eight hours. This is called shift work, and each group is called a shift. Most often, shifts work from 8 a.m. to 4 p.m., 4 p.m. to midnight, and midnight to 8 a.m. A fourth shift is needed if the plant is to run during weekends, although many pilot plants shut down at that time. This arrangement makes pilot plant experimentation unattractive to many chemical engineers who prefer to work during the day and leave the evening and night shifts to specially trained operators. However, a pilot plant is often complicated that engineers are required on all shifts.

Since the basic purpose of the pilot plant is to gather information, there are frequent changes of flowrates, pressures, and temperatures. R & D engineers are always looking for that combination of conditions that will enable them to produce the maximum amount of product at the minimum price. As information is gathered, it is passed along to the company's management. This may be done by memoranda and telephone calls but in most companies, once a month, the R & D engineers write all they have learned during the past month in a progress report. These become their main record of accomplishment. The purpose of R & D is to gather information: since a company's management judges R & D engineers by the reports they submit, a great deal of work goes into the reports' preparation. When the research and development project is completed, information on the various progress reports is consolidated into a final report that details everything learned during the research. This final report is invaluable to the process design engineers who will design the full-scale plant.

There is one thing about R & D that many engineers find frustrating: a project is seldom finished. As with all research, there are always more ideas than time or manpower. Eventually, the work must end, even get into full-scale production. The decision to end a project is usually made by the head of the research laboratories in consultation with the executives of the company.

1. What is the major job of R&D engineers?
2. When are pilot plants particularly useful?
3. What are the usual time periods for each shift?
4. Why is pilot plant work unattractive to some engineers?
5. What do chemical engineers look for when running a pilot plant?
6. How do R & D engineers pass on information to a company management?
7. Why do many engineers find R&D frustrating?
8. Who usually decides when a research project should be ended?

(14 Marks)

Q2: Define (**eight**) only of the following:

- a. Flowmeter; b. Hopper; c. Steam jacket; d. pilot plant; e. heat exchanger;
f. unit operation; g. Feasibility study; h. flowsheet; i. Plant operation engineer.

(16 Marks)

Q3: Put the verbs in brackets in the correct tense: (answer **fifteen** only)

1. Yousif (buy) a new camera last week.
2. The train for Basrah (leave) at eight every evening.
3. I (meet) your brother at the station.
4. Father (leave) for Syria next month.
5. The sun (rise) in the east.
6. The government (build) this bridge last year.
7. It (get) hot in July.
8. Maha (meet) her cousin at the airport tomorrow.
9. My brother never (be) in Paris.
10. Mother (hide) the gold ring in the drawer already.
11. You ever (hear) such an amusing story?
12. It (be) hot in recent weeks.
13. We will go to the north as soon as the holiday (begin) next Monday.
14. When the bank opens, I (draw) the money.
15. We (know) each other for years.
16. I (not see) you for ages.

(15 Marks)

Q4: Choose the right answer: (answer **fifteen** only)

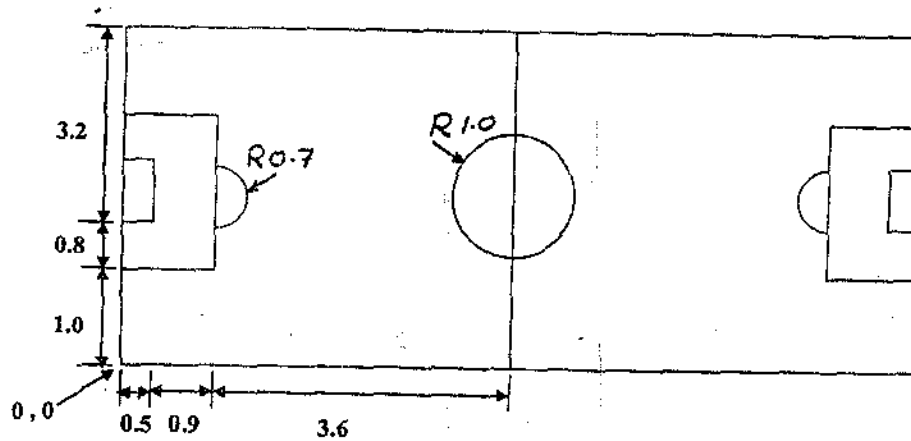
1. It (will stop, hasn't stopped, stops, has stopped) raining yet.
2. I (was posted, post, have posted, posted) the letter three days ago.
3. I wish I (can, may, could, will) meet him tomorrow.
4. It's time you (give, to give, gives, gave, are giving) the baby its food now.
5. Where will you travel next summer? I (travel, traveled, have traveled, will travel, traveling) to Europe.
6. What did Suha do last night? She (watches, will watch, watched, has watched) at the TV.
7. He hasn't finished the work (ago, already, just, yet).
8. He works as if he (is, are, be, were) a machine.
9. My father is going to leave for Lebanon (last month, yesterday, tomorrow, a week ago).
10. A month (since, before, ago, for) we visited Babylon.
11. He is ill. He wishes he (is, are, am, were) healthy.
12. It has been hot (before, ago, for, since) the last three weeks.
13. Tom is fat. He wishes he (can't, isn't, weren't, won't).
14. The tourists haven't time to visit Babylon. They wish they (have, has, will have, had) time.
15. He has left for London (tomorrow, yesterday, last month, recently).
16. He (last night, now, sometimes, next week) goes for a walk in the evening.

(15 Marks)

*** Good Luck ***

Answer Five Questions Only

Q1) A- Write down main steps to draw figure below using Auto CAD program commands.



Hint : use absolute coordinate and Mirror command.

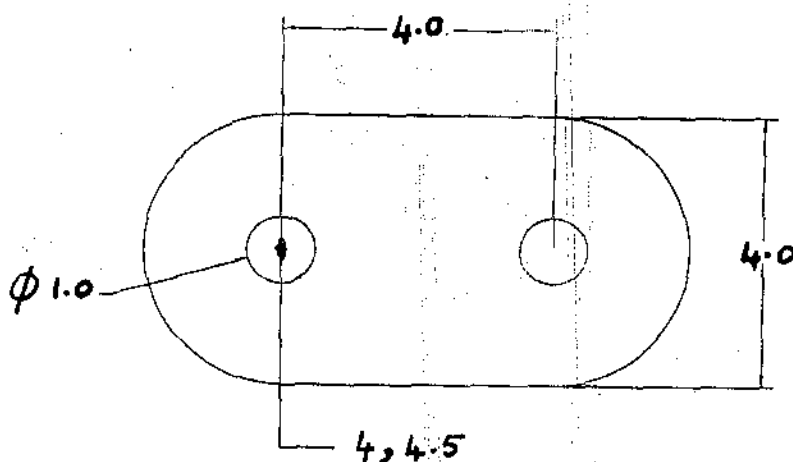
(6 Marks)

B- Give the full name for the expression

1- LAN 2- ALU 3- LWT 4- QAT

(4 Marks)

Q2) A- Use Auto CAD program commands to draw figure below



(6 Marks)

B- In what pull-down menu are the following commands found?

1- Chamfer 2- Copy 3- Explode 4- Baseline

(4 Marks)

Please Turn Over

Q3) A- What are the difference between:

- 1- Zoom Realtime and Pan Realtime
- 2- CC and BCC
- 3- Freeze and Hide Layers
- 4- Single line text and Multiline text
- 5- RAM and ROM
- 6- Redraw and Regen

(6 Marks)

B- How can you enter the following commands quickly at the keyboard?

- 1- Block
- 2- Offset
- 3- Hatch
- 4- Extend

(4 Marks)

Q4) A- Complete the following sentences:

- 1- ----- does not change the size of the drawing objects. It changes only display of those objects.
- 2- The ----- command automatically rounds a shape corner with a radius.
- 3- The ----- command is used to increase or decrease the size of objects in a drawing.
- 4- A ----- is a pattern of objects generated into rows and columns.
- 5- The ----- command allows you to shorten the end of an object back to the intersection of another object.
- 6- The ----- command deletes the objects you select from drawing.

(6 Marks)

B- In dimensions and text, what is the meaning of the followings:

- 1- Offset from origin
- 2- Offset from dim line
- 3- Extend beyond dim line
- 4- Text height

(4 Marks)

Q5) A- How could the "Polygon" be drawn?

(4 Marks)

B- How can you change the worksheet margins?

(4 Marks)

C- Define the followings:

- 1- Header and Footer
- 2- Rotate

(2 Marks)

Q6) A- Briefly describe the following methods of producing circles?

(4 Marks)

B- How can you print a cell range from a worksheet?

(4 Marks)

C- What is the duty of "Format Painter"?

(2 Marks)

Good Luck

Answer Four Questions Only

Q1) A- Graph the function $r^2 = 2a^2 \sin 3\theta$ in polar coordinate.

B- Find the following integrations:

1- $\lim_{x \rightarrow 1} (\sec(x) \sec^2 x - \tan^2 x - 1)$

2- $\lim_{x \rightarrow \infty} \frac{\cos(1/x)}{1+1/x}$

3- $\lim_{x \rightarrow \infty} \frac{\log(1+x^2)}{\log(1-4x^2)}$

(25 mark)

Q2) A- If $y = \operatorname{sech} t$ and $x = \cosh t$ prove that $\frac{d^2 y}{dx^2} + y \frac{dy}{dx} = y^3$

B- Find the values of x , y and z

$$2 \sinh x - \cosh y + \tanh z = 5$$

$$-2 \tanh z + 3 \cosh y - \sinh x = -1$$

$$-2 \cosh y - \tanh z + \sinh x = -8$$

(25 mark)

Q3) A- Find the integration of :

1- $\int \tan^3 2x \sec^2 2x dx$

2- $\int \frac{dx}{1 - \sin x}$

3- $\int \frac{4x+4}{x^2(x^2+1)} dx$

B- Prove that $\tan \theta = \frac{\sin \theta + \sin 2\theta}{1 + \cos \theta + \cos 2\theta}$

(25 mark)

Q4) A- Evaluate $\int \frac{dz}{z}$ around a circle with its center at the origin.

B- Find the volume of the solid generated by revolving the region bounded by $y = \sqrt{x}$, $y = 2$ and $x = 0$ about the line $x = 4$.

(25 mark)

Q5) A- Using vector analysis find the distance in the x - y plane between the line $x + 3y = 6$ and the point $(2, 8)$.

B- Find the following integrations:

1- $\int \cot x \ln(\sin x) dx$

2- $\int x \sec^{-1} x dx$

3- $\int \frac{dx}{(x-1)^2 - 4}$

(25 mark)

Good Luck

$$\sinh^{-1} x = \ln(x + \sqrt{x^2 + 1})$$

$$\cosh^{-1} x = \ln(x + \sqrt{x^2 - 1})$$

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$\sec^2 \theta = 1 + \tan^2 \theta$$

$$\sin 2\theta = 2 \sin \theta \cos \theta$$

$$\cos 2\theta = \cos^2 \theta - \sin^2 \theta$$

$$\cos^2 \theta = \frac{1 + \cos 2\theta}{2}$$

$$\sin^2 \theta = \frac{1 - \cos 2\theta}{2}$$

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$

$$\cos(A + B) = \cos A \cos B - \sin A \sin B$$

$$\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$\frac{d(\sin^{-1} u)}{dx} = \frac{du/dx}{\sqrt{1-u^2}} \quad -1 < u < 1$$

$$\frac{d(\tan^{-1} u)}{dx} = \frac{du/dx}{1+u^2}$$

$$\frac{d(\sec^{-1} u)}{dx} = \frac{du/dx}{|u|\sqrt{u^2-1}} \quad |u| > 1$$

$$\frac{d(\cos^{-1} u)}{dx} = -\frac{du/dx}{\sqrt{1-u^2}}$$

$$\frac{d(\csc^{-1} u)}{dx} = -\frac{du/dx}{|u|\sqrt{u^2-1}} \quad |u| > 1$$

$$\frac{d(\cot^{-1} u)}{dx} = -\frac{du/dx}{1+u^2}$$

$$\int \frac{du}{\sqrt{1+u^2}} = \sinh^{-1} u + C$$

$$\int \frac{du}{\sqrt{u^2-1}} = \cosh^{-1} u + C$$

$$\int \frac{du}{u\sqrt{1-u^2}} = -\sec h^{-1}|u| + C$$

$$\int \frac{du}{u\sqrt{1+u^2}} = -\csc h^{-1}|u| + C$$

$$\int \frac{du}{1-u^2} = \begin{cases} \tanh^{-1} u + C & \text{if } |u| < 1 \\ \coth^{-1} u + C & \text{if } |u| > 1 \end{cases}$$

University of Technology/Chemical Eng. Dep.

Final examination

First year

Year:2009/2010

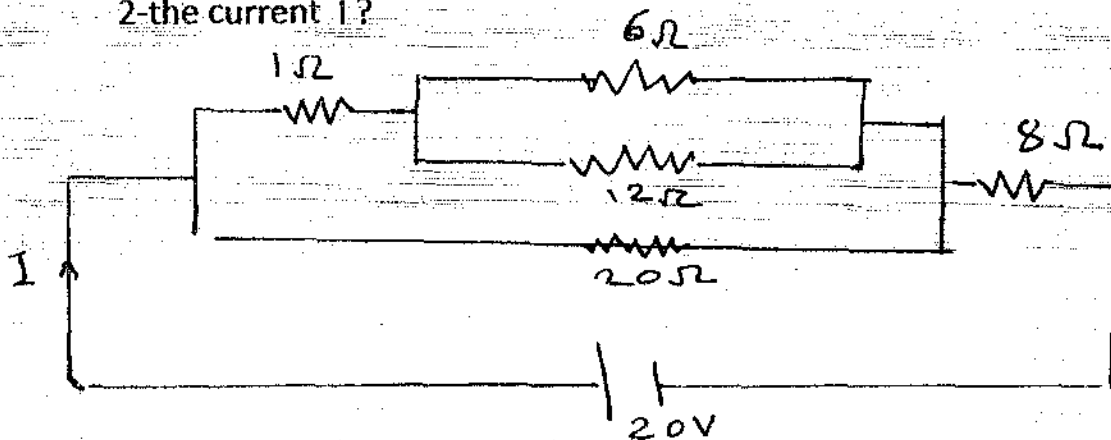
Subject:Electrical technology (time 3 hour) (Answer four equation)

Q1-(15 degree)

For the circuit shown in figure 1. Find:

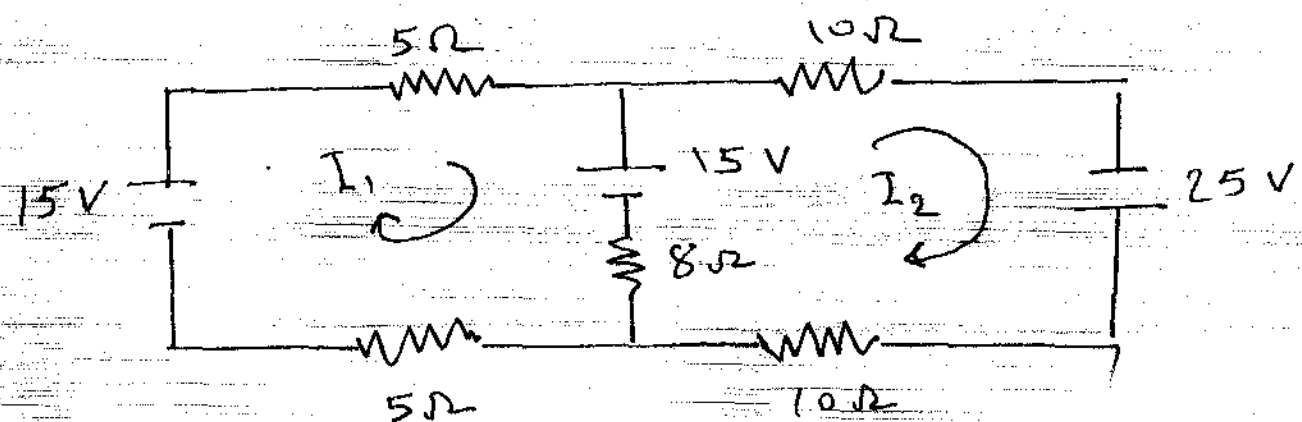
1-Equivalent resistance ?

2-the current I ?



Q2-(15 degree):

Using Kirchhoff's law to calculate the current in 8 ohm-resistance in the circuit shown in figure 2 ?



Q3-(15 degree):

A sinusoidal alternating current of frequency 20HZ has a maximum value of 120A. Find:

a-the average value of the current ?

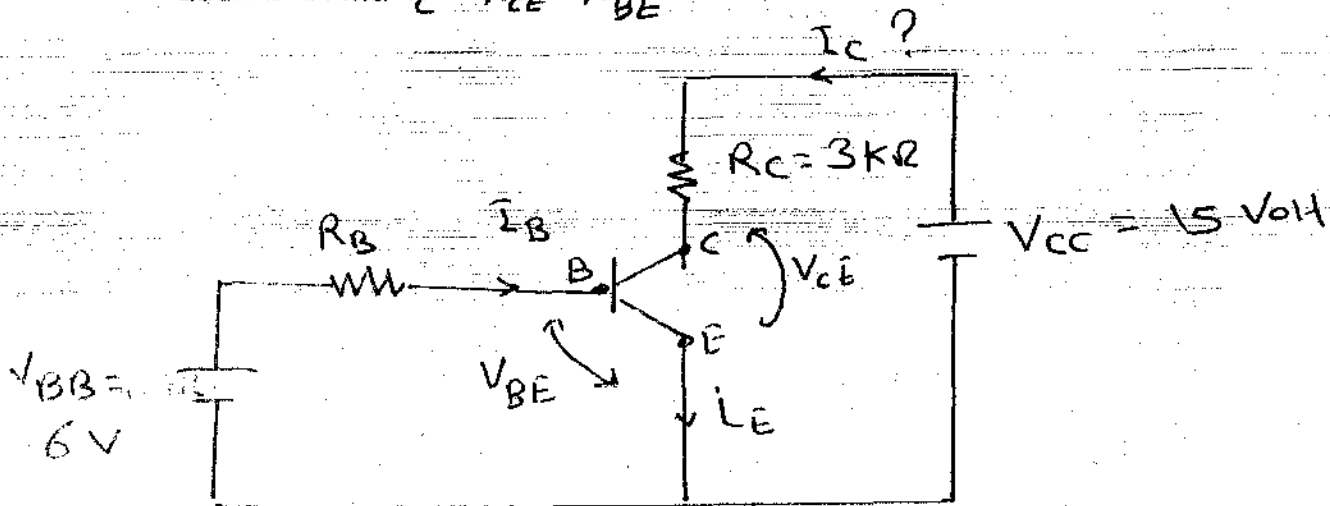
b-rms value of the current?

c-form factor for sine wave ?

d -the time take for the current to attain value of 100A ?

Q4-(15 degree):

for the transistor circuit shown in figure 3. $I_B = 40\mu A$, $\beta = 49$, $R_B = 130k\Omega$. Find I_C , V_{CE} , V_{BE}



Q5-(15 degree):

Answer only two of the following:

a-state the properties of high conductivity material

b-explain the transformer and how its work

c-give the arrangement and construction of germanium junction diode

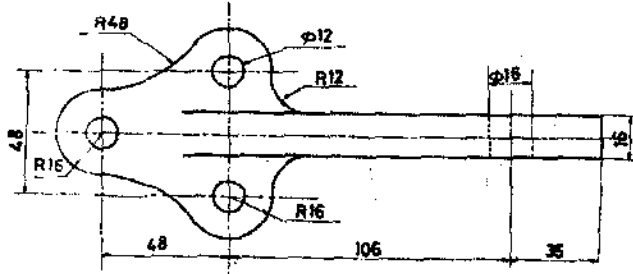
الصف: الاول
الوقت: 3 ساعات
المدرس: د. رمزي صيهود

امتحان الرسم الهندسي
الدور الاول
الثلاثاء 2010/6/15

الجامعة التكنولوجية
قسم الهندسة الكيميائية

15 درجة

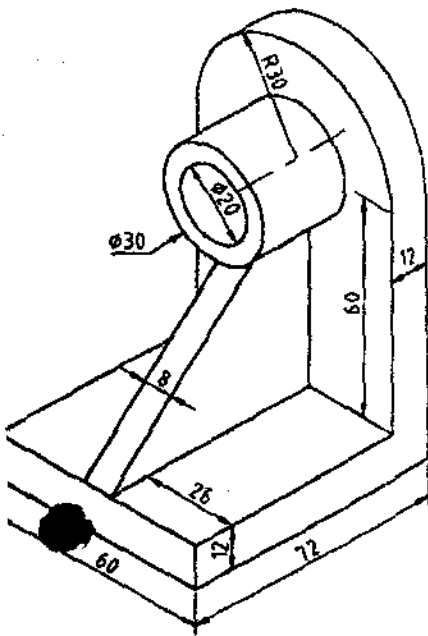
س¹: ارسم ما يلي بنفس الابعاد :



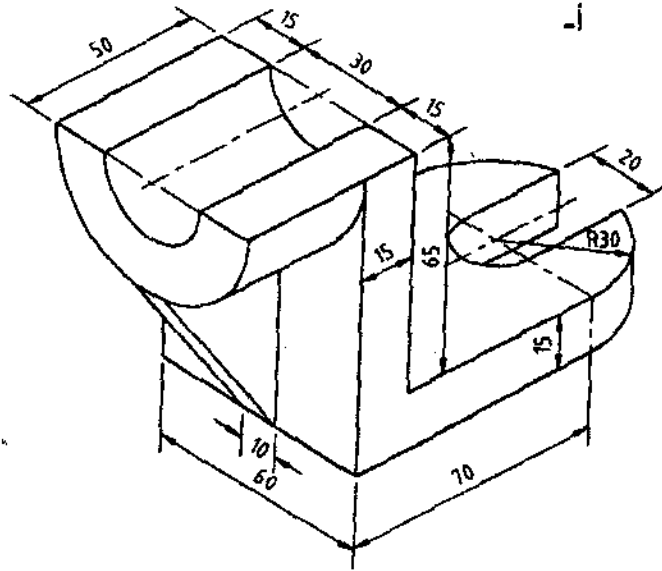
35 درجة

س²: ارسم لواحد مما يلي بنفس الابعاد :

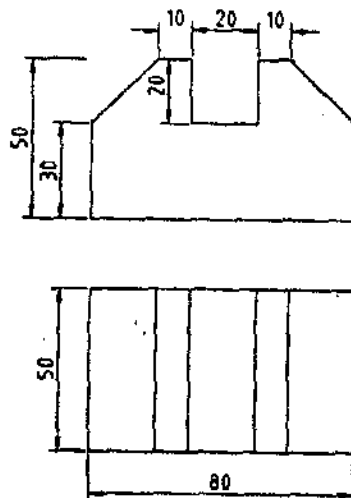
- 1- المقطع الامامي.
- 2- المسقط الجانبي.
- 3- المسقط الافقي (العلوي).



25 درجة



س³: ارسم الشكل الايزومتري لما يلي :



25 درجة

س 4 :

أ- استنتج المسقط الثالث (الجانبى).

ب- أكتب خطوات رسم المسقط الامامى والمسقط الجانبى ببرنامج ال (Auto CAD) باستخدام أحداثيات (Relative Coordinate) فقط، علما أن نقطة البداية هي (0,0).

