

Time: 3 Hours  
Marks: 110 Old status, 70 New status

**Answer the following questions, assume any missing data, if any:**

**Q1:** A computing center employs four key punchers: Ann, Barbra, Claudia and Diana. The director received five jobs that must be punched. All jobs take one full day. The setup cost of having two girls work on one job is high, therefore the director wishes to assign one job for every girl, and reject one job. The profit of each job is dependent upon the girl performing that job. The director wishes to assign jobs to maximize profit under the added conditions that:

- Ann cannot perform job ( i ) .
- There would be a penalty of 3 if job ( ii ) is the one which goes undone.

The following table shows profit of each job versus the girls performing them:

Girls	Jobs				
	( i )	( ii )	( iii )	( iv )	( v )
Ann	1	5	2	0	4
Barbra	4	7	5	6	3
Claudia	5	8	4	3	5
Diana	3	6	6	2	6

- (a) Help the director to give every girl the suitable job to maximize profit.  
(b) Formulate only the given problem as a LP problem.

**Q2:**

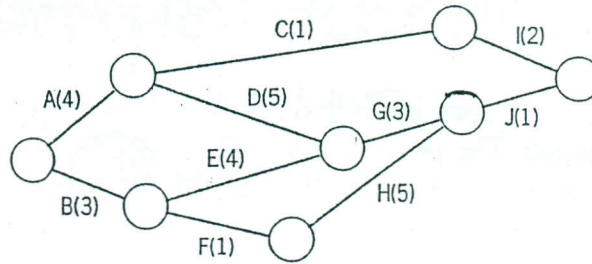
- (a) i- Explain what is meant by efficient production.  
ii- Compare in details and sketches between the 3 traditional types of production.
- (b) A small multi-purpose plant is used to manufacture in batches 2 different herbicides: mosnok and daisytox. These use different quantities of 2 active ingredients: CPA and DCP, produced by other plants within the group. There is a limit on the availability of this CPA and DCP. Moreover, the marketing section have established that there are both minimum and maximum numbers of batches of the herbicides required each week. The basic data is shown in the table below. The plant currently operates a three 8- hour shifts per day for six days per week. Using graphical method of LP, determine the number of batches of each herbicides to be produced in order to maximize the total profit, what would be that profit?

	Ingredients Kg per batch		Min. No. of batches per week	Max. No. of batches per week	Hours per batch	Profit per batch X \$ 10 <sup>3</sup>
	CPA	DCP				
Mosnok	10	10	1	9	12	10
Daisytox	5	17	1	9	12	10
Kgs available per week	100	170				

**Q3:**

(a) The following CPM network was prepared at the beginning of a small maintenance project. The duration, in days, follows the letter of each activity. What is the critical path? Which activities should be monitored most closely?

At the end of the first week ( 5 Days ) of maintenance, it was noted that activity A was completed in 2.5 days, but activity B required 4.5 Days. What impact does this have on the project? Are the same activities critical?



(b) Given an auditing project with the following activities:

Activity	Standard Deviation	Critical ?	Duration ( week )
a, add	2	yes	2
b, balance	1		3
c, count	0	yes	4
d, deduct	3		2
e, edit	1	yes	1
f, finance	2		6
g, group	2	yes	4
h, hold	0	yes	2

Find:

- i- The probability of completing this project in 12 weeks ( or less ), as the client desires.
- ii- The probability of completing this project in 13 weeks ( or less ) .
- iii- The number of weeks required to assure a 92.5 percent chance of completion, as guaranteed by the auditing firm.

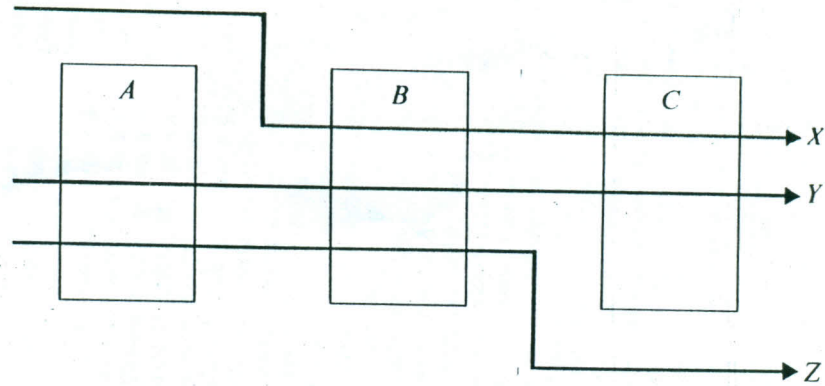
**Q4:** The Across Company, having 4 plants and 4 warehouses, uses the MUC method to find the shipping plan and costs. The table below was obtained where the number in the upper left-hand corner of each cell represents a unit cost while the circled numbers represent the current assignment.

Warehouse:	1	2	3	4	Capacity
Plant: A	\$9	\$8 (26)	\$12	\$10 (10)	36
B	\$10	\$10 (4)	\$12 (40)	\$14	44
C	\$8 (12)	\$9	\$11	\$11	12
D	\$10	\$10	\$11 (20)	\$12	20
Sales requirement	12	30	60	10	112

- (a) Is this an correct assignment? Prove it.
- (b) If not correct, what change would you make? Show your shipping plan and its cost.



**Q5:** ABC Manufacturing Company produces 3 products named X, Y and Z. Each product must go through some or all of three manufacturing processes, named A, B and C as shown in the figure shown below.



The per hour capacities of the three processes are shown in the table below.

Product	Process		
	A	B	C
X		50	40
Y	40	50	20
Z	50	25	
Running cost ( \$ )	500	1000	800

The cost of material and the selling price of each product are shown in the table below.

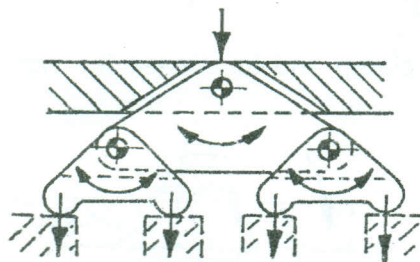
Product	Material cost ( \$ )	Selling price ( \$ )
X	10	75
Y	20	120
Z	15	80

The company wants to plan the production so as to maximize the total profit.  
Use simplex method to formulate, construct the first table then develop **only** the next table.

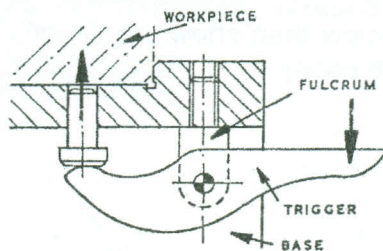
*Best Wishes*  
*Mahamed Sabeih*

**First Question: ( 15 mark)**

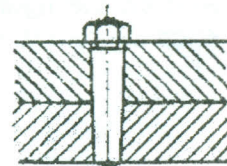
Name only the following figures with their suitable locating or clamping system.(3 marks each)



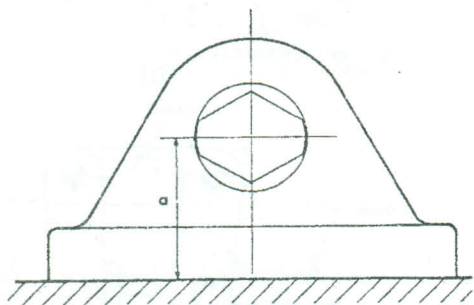
(a)



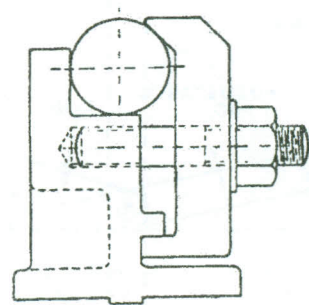
(b)



(c)



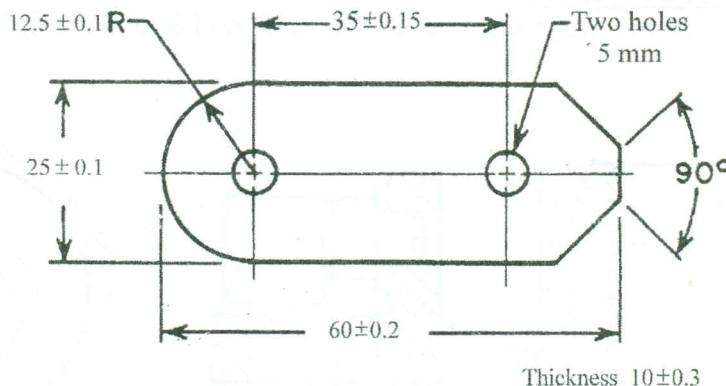
(d)



(e)

**Second Question: ( 20 marks )**

To drill the two holes of 5 mm in diameter for the workpiece shown in figure, using the principle design of Vee pads, draw the required locating system. **The draw must be with suitable scale.**



**Third Question: ( 20 marks)**

a) Match the letter values (1<sup>st</sup> column) to the numbers indicating the characteristic or application of that clamp type (2<sup>nd</sup> column). The answer should be as for example (A-01).

(2 marks each = 10 marks)

- A) Strap clamp
- B) Screw clamp
- C) Toggle clamp
- D) Cam clamp
- E) Molded clamp

- 01) Could loosen when vibrated
- 02) Uses epoxy or low-melt alloys
- 03) Lever action
- 04) Operates on spring pressure
- 05) Must have single operating point
- 06) Pivot and lever action
- 07) Uses thread generated torque