

1. **(40 marks)** Suppose you had to select from wood, wax, and clay as your material of choice for the MÉC logo in your design project. Imagine that you have identified the selection criteria as ease of manufacture (50% importance), cost (10% importance), aesthetic appeal (30% importance), and availability (10% importance). Suppose that you have scored the characteristics of each of these three materials against the selection criteria on a scale of 1 to 10, where 10 is the most desirable. These scores are mentioned below:

Selection criteria	Score for Wood	Score for Wax	Score for clay
Cost:	5	6	7
Ease of manufacture:	5	2	3
Aesthetic appeal:	5	5	3
Availability:	5	5	5

Develop a weighted decision matrix and determine the material to be chosen on this basis.

Selection criteria	Weight	Wood		Wax		Clay	
		Score	Rating	Score	Rating	Score	Rating
Cost	0.10	5	0.5	6	0.6	7	0.7
Ease of manufacture	0.50	5	2.5	2	1.0	3	1.5
Aesthetic beauty	0.30	5	1.5	5	1.5	3	0.9
Availability	0.10	5	0.5	5	0.5	5	0.5
Total	1.0		5.0		3.6		3.6

Material chosen: Wood (total rating of 5.0 is the highest of the three)

2. **(20 marks)** The Dieter text mentions three major steps in a design process, and so does Morris Asimow. There is an approximate correspondence between the three phases as described by these two authors. Fill in the table below by writing the names of the three design phases as described by these two authors. (Do not explain, nor describe anything.)

Design phase	Asimow terminology	Dieter terminology
Phase 1:	Feasibility study	Conceptual design
Phase 2:	Preliminary design	Embodiment design
Phase 3:	Detail design	Detailed design

3. **(10 marks)** In engineering design, what is the meaning of the term, “prototype”?

A prototype is the first full scale working model (or one of the first few such models) which is (are) used to demonstrate and/or test the design.

4. **(20 marks)** For what purpose, and in which phase of the design process, might a designer use the Buckingham pi theorem?

For scale modeling in the detail design stage (phase 3).

5. **(10 marks)** Give another name for the “physical realizability” of a design.

Technical feasibility

6. **(10 marks)** One factor on the basis of which plausible design solutions are sorted out in the feasibility study stage is “physical realizability.” What are the two other factors?

1. Economic viability
2. Financial feasibility

7. **(15 marks)** In class we discussed that QFD may be used to transform CRs into ECs. Write the full forms of the abbreviations QFD, CR, and EC.

Quality Function Deployment (QFD)
Customer requirement (CR)
Engineering characteristic (EC)

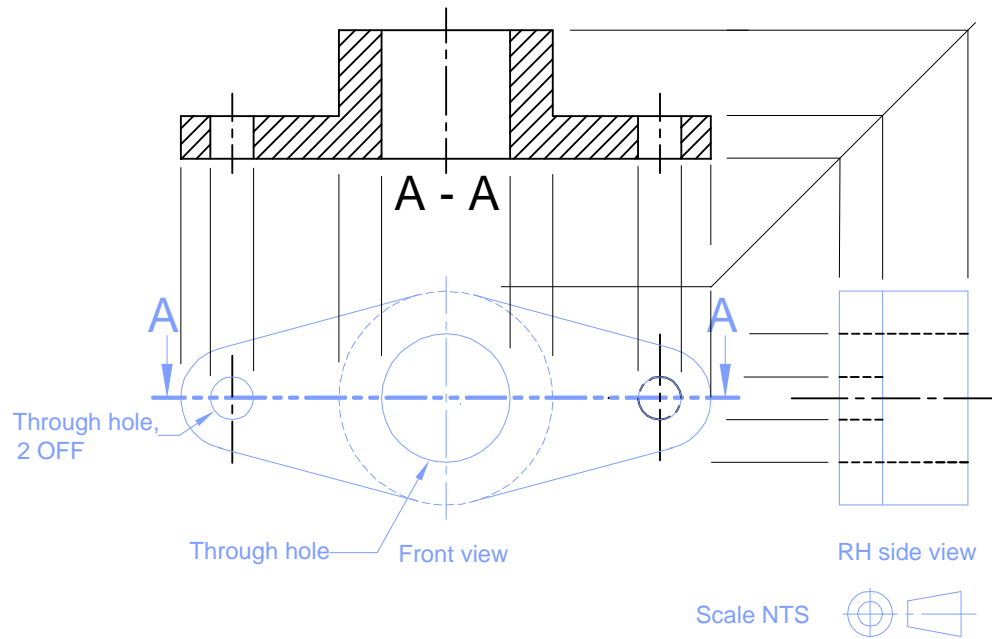
8. **(10 marks)** What is the Gantt chart used for? (Answer in one short sentence)

The Gantt chart is a scheduling tool.

9. **(10 marks)** Designers often perform a repetitive procedure where each repetition brings them closer to a desired solution. What is the term that is used to describe this process?

Iteration

10. (40 marks) Two views of an object, in orthographic projection, are shown below. The front view is complete. The right hand side view is incomplete. Complete the side view, and draw the relevant missing view. Use instruments to draw. Show all necessary projection lines.



11. (10 marks) Draw two different linetypes which may be used to depict centerlines in engineering drawing.

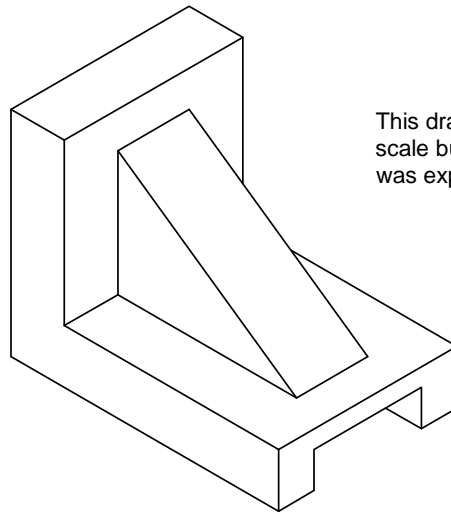
See the Mid-semester exam 1 solution (the question is repeated in this exam)

12. (10 marks) Draw two different linetypes which may be used to depict sectioning lines in engineering drawing.

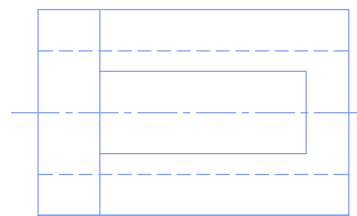
See the Mid-semester exam 1 solution (the question is repeated in this exam)

13. (50 marks) Using instruments, draw a full scale isometric view of the object whose orthographic views are shown below.

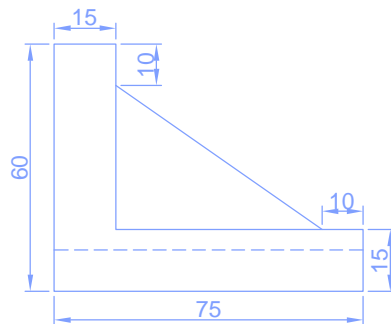
In the following solution, the front view has been used to draw on the left isoplane. You could choose to use the right hand side view to draw on the left isoplane, in which case, the back view will show up on the right isoplane. Either solution is acceptable.



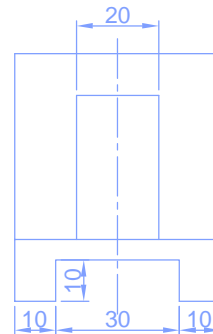
This drawing is not to full scale but your drawing was expected to be so



TOP VIEW



FRONT VIEW



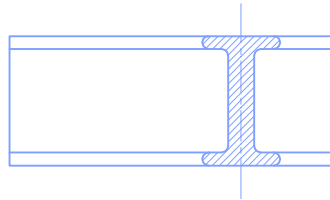
RH SIDE VIEW

All dimensions are in millimeters

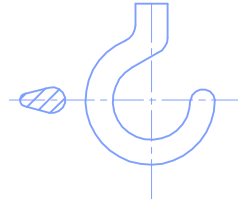
SCALE: NTS



14. (10 marks) Identify the two different types of section in the two figures given below. Write your answers in the space provided below the two drawings (Just name the type of section. Do not explain, nor describe anything).



Answer: Revolved section



Answer: Removed section

15. (10 marks) Write the names of the three different types of axonometric projection as per the American system of classification of pictorials.

1. Isometric 2. Dimetric 3. Trimetric

16. (5 marks) Write the size of standard A1 paper. (Hint: A1 is bigger than A4)

840 mm x 594 mm (Comment: 8 times the size of 297 x 210 we have been using as A4)

17. (10 marks) Explain the difference between an isometric projection and an isometric drawing (in one or two short sentences)

Lengths of isolines are foreshortened in the isometric projection but not so in the isometric drawing.

18. (10 marks) Name the machine tool that you observed in the prototype lab which may be used to machine parts having cylindrical symmetry? (Just name it, do not describe. It is not the drilling machine.)

The Lathe