



UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
SEPTEMBER 2013 SESSION

SUBJECT CODE : FMB 31203
SUBJECT TITLE : MACHINE TOOL DESIGN
LEVEL : BACHELOR
TIME / DURATION : 2 HOURS
DATE :

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper **CAREFULLY**.
 2. This question paper is printed on both sides of the paper.
 3. Please write your answers on the answer booklet provided.
 4. Answer should be written in blue or black ink except for sketching, graphic and illustration.
 5. This question paper consists of **TWO (2)** sections. Section A and B. Answer **ALL** questions in Section A. For Section B, answer **THREE (3)** questions only.
 6. Answer all questions in English.
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THERE ARE 4 PRINTED PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 40 marks)

INSTRUCTION: Answer ALL questions.
Please use the answer booklet provided.

Question 1

With reference, there is **NO** one definition which adequately defines 'design' briefly describes;

- (a) Your own definition to design (the verb).

(10 marks)

- (b) How importance of design in terms of business, development and sustainability.

(10 marks)

Question 2

- (a) Briefly state the design process.

(10 marks)

- (b) List down 5 characteristics of indeterminate design tasks.

(5marks)

- (c) Explain about Deterministic and non-deterministic natural progression in design.

(5 marks)

SECTION B (Total: 60 marks)

INSTRUCTION: Answer THREE (3) questions ONLY.

Please use the answer booklet provided.

Question 3

Design Process

- (a) Draw and label the Waterfall Diagram for design control. (10 marks)

- (b) What is a Design History File (DHF)? What information/data should be placed in to it? (5 marks)

- (c) Consider the design of an elevator (passenger lift). Identify a list of needs in 3 scenarios: normal use, dysfunction, abuse/misuse for two sets of users – the passengers and the building operators. Number each need and mark with an asterisk functional needs.

You might choose to lay your answer out in a tabular format similar to that given below.

user	needs in:		
	normal	dysfunction	abuse/ misuse
	use		(5 marks)

Question 4

Construct a Design Input Specification for the needs and users above.

- (a) Expand three of your user needs into example design input specifications – do not worry if you cannot put values in, just show what sorts of statements might be entered into the design input specification. Ensure that needs traceability is maintained through an appropriate numbering scheme.

(10 marks)

- (b) In an indeterminate design process design output and understanding of the true needs co-evolve. Describe what this statement means and explain how this co-evolution takes place.

(10 marks)

Question 5

- (a) Determine the rpm of a lathe spindle if a work-piece of diameter 100 mm is to be turned at a cutting speed of 88 m/min.

(6 marks)

- (b) A 40 mm hole is drilled at a speed of 30mm/min and feed of 0.1 mm/tooth. Calculate the feed per minute of the operation.

(8 marks)

- (c) List down the three machine tools that can be classified by different criteria of the degree of automation and briefly explain each one of them.

(6 marks)

Question 6

Gear # 1 has a pitch diameter $d_1 = 100$ mm and number of teeth $N_1 = 25$. The teeth feature involute profiles and the pressure angle Φ is 20° . Considering this gear, answer the following questions:

- (a) What is the name and numerical value of the distance measured on the pitch circle, between two similar points located on two consecutive teeth?

(2 marks)

- (b) Is gear # 1 a normalized gear?

(2 marks)

- (c) Supposing that there is no backlash, calculate the numerical value of the tooth thickness for gear # 1. Assume that the tooth thickness is measured on the pitch circle.

(5 marks)

- (d) Calculate the value of the addendum for gear # 1.

(5 marks)

- (e) Gear # 1, described above with $N_1 = 25$, meshes with another gear # 2 with $N_2 = 36$. Calculate the bending stress generated in the teeth of gear # 1, when transmitting a power of 10kW at a rotational speed of 3600 rpm.

Module	= 4 mm
Face width	= 12 mm
Gear quality number Q_v	= 4

(6 marks)

END OF QUESTION