Document No : UniKL MFI_SD_AC41
Revision No: 02
Effective Date: 01 December 2008

CONFIDENTIAL

SET B

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JANUARY 2010 SESSION

SUBJECT CODE	:	FMB 21202
SUBJECT TITLE	:	MACHINE TOOL DESIGN
LEVEL	:	BACHELOR
TIME / DURATION	:	9.00am – 11.00am (2 HOURS)
DATE	:	27 APRIL 2010

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 FIVE (5) questions. Answer FOUR (4) questions only.
6. Answer ALL questions in English.

THERE ARE 3 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

INSTRUCTION: Answer any FOUR questions.
Please use the answer booklet provided.

Question 1

(a) Why design calculation is important in machine tool design process?

(2 marks)

(b) What are the different mechanisms used for converting rotary to translatory motion ? Briefly explain one of the method.

(5 marks)

(c) Draw the neat sketch of Norton drive feed gear box and discuss briefly how it works.

(8 marks)

(d) Write about stepped speed regulators in machine tools.

(5 marks)

(e) A machine spindle is to be used for roughing and finishing aluminium workpiece of 80 mm in diameter. Find the range ratio and RPM for roughing and finishing. (roughing speed = 70 m/min, finishing speed = 100 m/min)

(5 marks)

Question 2

(a) Profile of machine tool structure is very important when designing machine tool. Explain.

(5 marks)

(b) What are the various methods to improve the rigidity of machine tool structure? Discuss one of the method.

(5 marks)

(c) Discuss the shapes and profile of guideways and their features.

(7 marks)

(d) Differentiate between slideways and anti friction ways.

(5 marks)

(e) Give the uses of seals and intermediate steel strip for slide way.

(3 marks)

Question 3

(a) State the essential requirements of spindle units.

(5 marks)

(b) List out the advantages of hydrostatic bearing.

(5 marks)

(c) What are the main element in the machine tool control systems?

(6 marks)

(d) Why ergonomics is important in machine tool design?

(6 marks)

(e) What are the function of machine control unit in CNC machine tool?

(3 marks)

Question 4

(a) Draw the speed chart for the optimality for the speed box if the number of steps are 6, N_{min} = 56 rpm, N_{max} = 1000 rpm and no of stages = 2. Motor rpm is 1440. Also calculate the transmission ratio for all shafts by using maximum transmission ratio = 4 – 0.5. What conclusion can you make based on the calculated transmission ratio.

(25 marks)

Question 5

(a) Design a square column for a drilling machine, if the column height is 2 m, maximum torque = 7 kgm, feed force = 500 kg. Distance of drill center from column (throat) = 300 mm. Given $E=1.2 \times 10^4$ kg/mm^2.

(15 marks)

(b) Calculate the range ratio and step ratio for to be used for rough turning (30 m/min) and finishing size (50 m/min) aluminium workpieces from 50 mm to 200 mm in diameter. Also find the RPM for roughing and finishing. Given z = 6

(10 marks)

END OF QUESTION

Table 1: Wall thickness (t) and size factor (s)

Size factor (s)	0.4	0.75	1.0	1.5	1.8	2.0	2.5	3	3.5	4.5
Wall thickness External (t_e)	6 [.24"]	8 [.31"]	10 [.39"]	12 [.47"]	14 [.55"]	16 [.63"]	18 [.71"]	20 [.79"]	22 [.87"]	25 [.98"]
Internal (t_i)	5 [.2"]	7 [.27"]	8 [.31"]	10 [.39"]	12 [.47"]	14 [.55"]	16 [.63"]	16 [.63"]	18 [.71"]	20 [.79"]