



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

EMM 508: FLEXIBLE MANUFACTURING SYSTEMS

DATE: Friday 13th April, 2012

TIME: 11.00 a.m. – 1.00 p.m.

INSTRUCTIONS

The paper consists of FIVE questions.

Answer any THREE (3) questions.

Use clear and neat diagrams.

Answer books provided.

All questions carry 20 marks each.

Question one

- a) Explain the principle of Flexible Manufacturing System. [4 marks]
- b) Explain two major limitations of adopting flexible manufacturing systems in a small scale industry. [4 marks]
- c) Explain three major components of Flexible Manufacturing Systems, and give one practical example in each case. [6 marks]
- d) Describe three levels of manufacturing flexibility as applied in flexible manufacturing systems. [6 marks]

Question two

- a) Explain the following problems associated with the use of Flexible manufacturing systems and outline TWO issues associated with each problem:
 - i. FMS planning problems
 - ii. FMS control problems
 - iii. FMS scheduling problems

iv. FMS Design Problems [16 marks]

- b) Explain two major limitations of adopting flexible manufacturing systems in a small scale industry. [4 marks]

Question three

- a) Describe four benefits of implementing an integrated tool management system in flexible manufacturing systems. [6 marks]
- b) Describe three technical constraints related to tool allocation at machine tool level. [9 marks]
- c) The Life-over-Size ($L = S$) method has been proposed to concurrently solve the tool selection and allocation problems in FMS. Outline the basic steps of the L/S tool selection heuristic. [5 marks]

Question four

- a) Explain any four factors from tool management perspective that are major players on the performance of flexible manufacturing systems. [8 marks]
- b) Explain the term material handling as applied to flexible manufacturing systems and give one practical case. [4 marks]
- c) Explain four major material handling principles. [4 marks]
- d) Explain the term guide path layout and describe four types of guide path layout. [4 marks]

Question five

- a) Why is workstation layout an important consideration in the manufacturing systems? [3 marks]
- b) Why does the number of workstations in a system have an impact upon the type of manufacturing system that is finally implemented? [4 marks]
- c) What is meant by the manning level of a workstation? Explain the levels for single and multi-station systems. [6 marks]
- d) Machine shop contains number of machines with cycle time for one particular part of 2.75min. One worker can load and unload machines in 25 sec. It takes 20 sec to walk between machines. How many machines can one worker manage if no machine idle time is allowed? [7 marks]

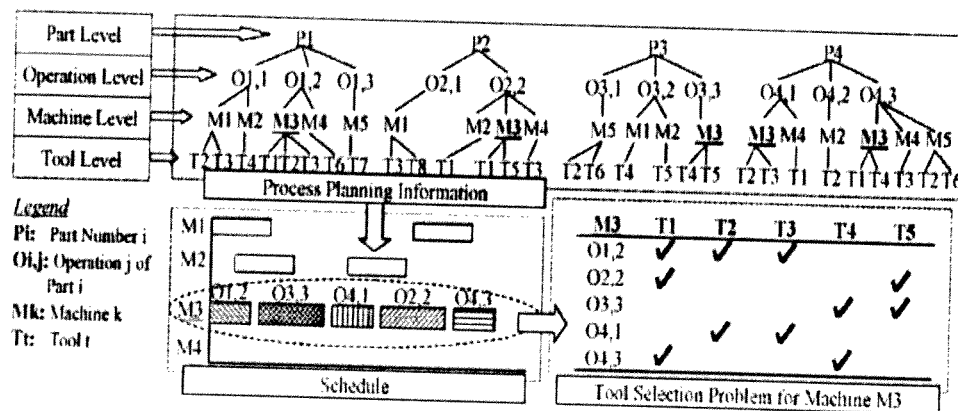


Fig. 1. Schematic representation of tool selection problem.

Table 1
Life and size of cutting tools

Tool ID	Life	Slots	L/S
T1	120	3	40
T2	100	1	100
T3	90	2	45
T4	60	1	60
T5	90	1	90
T6	110	2	55

Table 2
Cutting tool alternatives for operations on machine M

Operations	Tool alternatives					
	T1	T2	T3	T4	T5	T6
Op1	×					
Op2		×		×		
Op3			×		×	×
Op4		×			×	
Op5	×		×			
L/S	40	100	45	60	90	55
Priority	6	1	5	3	2	4

