

PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Final Examination: Semester I
Date: October 1, 2007
Subject: 226-341 Maintenance Engineering

Academic Year: 2007
Time: 9:00 – 12:00
Room: A400

Instructions

- Write your name and student ID on the exam paper.
- Write your answer in this exam paper, show your work clearly and legibly.
- This is an opened-book examination.
- There are 9 problems and total score is 115.
- Carefully read the problems and answer all questions in each problem.

ทฤษฎีในการสอบ โทษขั้นต่ำ คือ พักการเรียน 1 ภาคการศึกษา และปรับตกในรายวิชาที่ทฤษฎี

Problem (Full score)	Score
1 (20)	
2 (10)	
3 (15)	
4 (5)	
5 (5)	
6 (10)	
7 (20)	
8 (10)	
9 (20)	
Total (115)	

Do your best and good luck

Thanate Ratanawilai

Signature

1. A special purpose machine is operated to produce a product A 6 days per week, three shifts per day, and 5 hours per shift. The average actual output to produce product A is 2496 parts per week. An OEE of this CNC machine is measured whereas the following is a list of losses encountered during the machining process:
- Tapping head has to be replaced once every 6 weeks. The replacement takes 10 hours each time.
 - The circle saw blade has to be replaced twice a week and takes 50 minutes.
 - The drilling head breaks once every day so that 35 parts have to be re-worked and it takes one hour to replace the drill.
 - The bar feeder does not work properly so the part is cut too short. This causes a minor stoppage that happens 5 times per day and takes 10 minutes to clear and 3 parts are lost.
- 1.1 Calculate the overall effectiveness of this machine. (10 marks)
- 1.2 If the drilling head breakdown was changed from one hour to one and half hour, will it affect the OEE? Explain. (5 marks)
- 1.3 Is it possible to have the OEE more than 100%? Why. (5 marks)



2. Let say that that the maintenance class is one of the production lines in the university. What are the six big losses of this production line? Give the reason. (10 marks)

3. Explain the meaning of the followings

Machine neck (3 marks)

Man neck (3 marks)

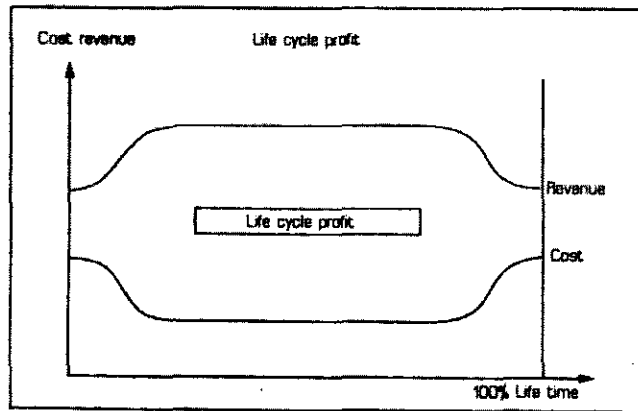
Fish bone diagram, how is it important to maintenance system? (3 marks)

PDCA cycle, how is it important to maintenance system? (3 marks)

Human five senses, how is it important to maintenance system? (3 marks)

4. Is it correct to say that “cleaning” is an inspection”? Why, give an example? (5 marks)

5. Describes “the life cycle profit” as shown in the figure below. (5 marks)



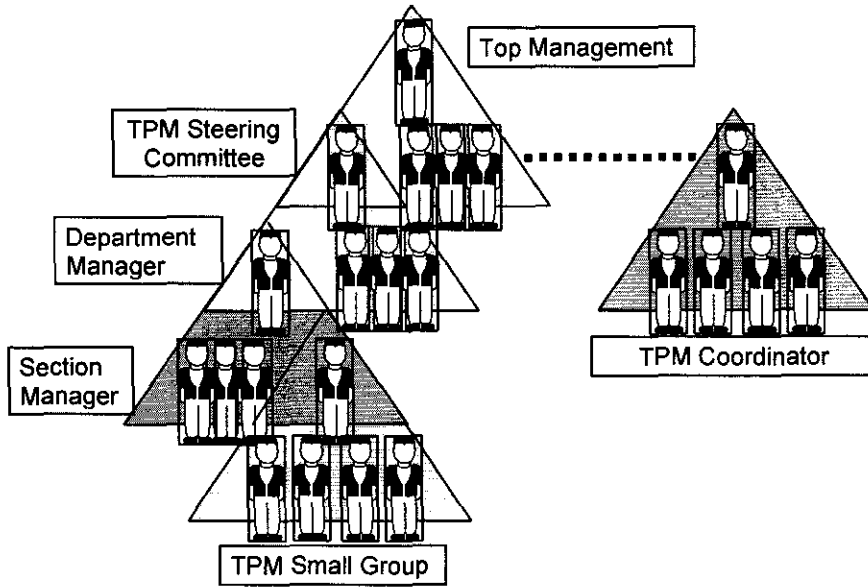
6. (a) What is “clean production” and how to start in the production line? (5 marks)

(b) What is the relation between the clean production and maintenance system? (5 marks)

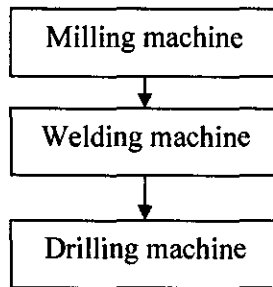
7. If you are a member of the team to establish TPM system for the Industrial Engineering Department, Prince of Songkla University. How could you apply TPM 8 pillars to start until complete this TPM project? Explain each step in details. All data can be assumed if necessary. (20 marks)



8. Explain the organization chart below. How is it important? (10 marks)



9. Three main operations shown in the figure below are utilized for making a small part of a motorcycle.



Construct the preventive maintenance in the given tables by selecting 2 out of the 3 machines above and choosing 3 parts from each selected machine. (20 marks)

Machine / Equipment Analysis

Machine / Equipment list	Machine characterization and how to operate	Priority	working continuously / automatically / periodically	Work condition 1. time to operate 2. hour/day day/week week/year	Main part



(MAINTENANCE ANALYSIS-MTBF)

Frequency and Planning

- | | | | |
|-------|-----------------------------|-------|---------------|
| (1) ☉ | : Clean | (4) ○ | : Adjustment |
| (2) Δ | : Lubrication - Top up | (5) ⊕ | : Repair |
| ○ | : Lubrication - Replacement | ○ | : Replacement |
| (3) ○ | : Inspection | (6) ○ | : Overhaul |
| ● | : Functional Check | | |

	Machine/Equipment	MTBF-Frequency				Last Maintenance Date	Next Maintenance Date
		D/T	W/T	M/T	Y/T		
1							
2							
3							
4							
5							
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Suppa

ANNUALLY MAINTENANCE SCHEDULE

PLANT :

DEPARTMENT :

- (1) ○ : Clean
- (2) △ L : Lubrication - Top up
- (3) ○ L : Lubrication - Replacement
- : Inspection
- : Functional Check
- (4) ○ : Adjustment
- (5) ⊕ : Repair
- : Replacement
- (6) ○ : Overhaul

1	2	3	4	5	6	7	8	9	10	11	12	MACHINE AND EQUIPMENT	MTBF.		
													MECH	ELEC	INST
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	Remark :	● Functional Check		
												Lubrication follow the lubrication schedule	▲ Inspection		
												○ Overhaul	○ Clean		
												○ Replacement	○ Cleaning		
												○ Repair	⊕ Repair		

Adhy

