

Student name :Code :Section :



PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Final Examination : Semester 2

Academic Year : 2009

Date : 20 Feb 2010

Time : 9.00-12.00

Subject : 226-341 Maintenance Engineering

Room : Robot

คำสั่ง

1. ข้อสอบมีทั้งหมด 2 ส่วน ในกระดาษคำถาม 14.หน้า (นับให้ครบก่อนลงมือทำ)
2. ห้ามการหยิบยืมสิ่งใด ๆ ทั้งสิ้น จากผู้อื่น ๆ เว้นแต่ผู้คุมสอบจะหยิบยืมให้
3. ห้ามนำส่วนใดส่วนหนึ่งของข้อสอบออกจากห้องสอบ
4. ผู้ที่ประสงค์จะออกจากห้องสอบก่อนหมดเวลาสอบ แต่ต้องไม่น้อยกว่า 30 นาที ให้ยกมือขออนุญาตจากผู้คุมสอบก่อนจะลุกจากที่นั่ง
5. เมื่อหมดเวลาสอบ ผู้เข้าสอบต้องหยุดการเขียนใด ๆ ทั้งสิ้น
6. ผู้ที่ปฏิบัติเข้าข่ายทุจริตในการสอบ ตามประกาศคณะกรรมการ มีโทษ คือ **ปรับตกในรายวิชาที่ทุจริต และพักการเรียน 1 ภาคการศึกษา**
7. ให้ทำในกระดาษคำตอบเท่านั้น ตอบนอกกระดาษ คำตอบไม่มีคะแนน
8. เขียน ชื่อ **หรือรหัส** ในกระดาษคำตอบทุกหน้าก่อนเริ่มทำ เพื่อป้องกันความสับสน ในกรณีกระดาษคำตอบหลุดจากฉบับ
9. ให้นักศึกษาสามารถนำสิ่งต่อไปนี้เข้าห้องสอบได้
 - ตำรา หนังสือ
 - กระดาษ A4 **ได้ 2 แผ่น** (เขียนด้วยลายมือตนเอง และ**ให้ส่งมาพร้อมข้อสอบ**)
 - นำ Dictionary และ เครื่องคิดเลข เข้าห้องสอบได้ (ห้ามบันทึกข้อมูลที่เกี่ยวข้องกับวิชานี้)
10. ให้ทำข้อสอบโดยใช้ ดินสอ ปากกา

ผู้ออกข้อสอบ ผศ.ดร.กลางเดือน โพนนา และ ผศ.ดร.ธเนศ รัตนวิไล

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Part A : Dr. Klangduen Pochana

Question#	1	2	3	4	Total
Full score	10	10	10	20	50
Score					

Question 1 Answer all questions. Please determine whether these following sentences are correct or incorrect. One point (1 point) will be given for the right answer. Minus half point (-0.5 point) will be given for the wrong answer. (Total 10 points)

Q no. 1.	Correct ✓	Incorrect ✗	Question
1			Large factory is A good coding system should be easily decoded.
2			Economic order quantity is normally used for ordering maintenance material group C for maintenance works.
3			Pulley is classified in a category of electrical spare parts.
4			The maintenance data system should be separately designed from the organization data system since the data is totally different.
5			One of the differences between maintenance stock and raw material stock is quantity of use.
6			Repair application slip should include maintenance method, root cause of problem, type and number of spare parts used, etc, and this slip must be filled by the operator.
7			The material that is cheap and life-unpredictable should be kept as a permanent store.
8			The material that is inexpensive and causes low down time loss should be kept as a non-permanent store.
9			Wrench is one of the disposal materials in maintenance store.
10			Machine daily inspection is normally performed by the maintenance man who is responsible for that machine.



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Question 2. Select optimum answers. (10 points)

Q	Answer			
1	a	b	c	d
2	a	b	c	d
3	a	b	c	d
4	a	b	c	d
5	a	b	c	d
6	a	b	c	d
7	a	b	c	d
8	a	b	c	d
9	a	b	c	d
10	a	b	c	d

Questions

- Education and training is included in which phase of TPM
 - Preparation phase
 - Kick off phase
 - Execution phase
 - Maintaining and development phase
- Which answer is **NOT** related to OEE?
 - Machine setup time
 - Speed loss of machine
 - Training time of maintenance man
 - No correct answer
- TPM Excellent Award is included to which phase of TPM implementation?
 - Preparation phase
 - Kick off phase
 - Execution phase
 - Maintaining and development phase
- Which country is an origin of TPM concept?
 - England
 - Germany
 - USA
 - Japan

- Which type of maintenance material should be controlled by 2-bins method?
 - Gear box
 - Gear lubrication oil
 - Conveyor belt
 - Rubber washer
- Which group of maintenance material is included "Drills"?
 - mechanical spare part
 - Electrical spare part
 - Machine tools
 - Disposal material
- Which type of maintenance organization is suited to be applied for the case where the equipment for plural products series exists in the large-scale plant?
 - Compromised type
 - Area type
 - Centralized type
 - No correct answer
- The decentralized maintenance organization is suitable for the organization that.....
 - : maintenance man and machine operator can work together
 - : needs high skill technician.
 - : has a few number of technicians
 - : area for maintenance service are relatively large
- Which type of maintenance material should **NOT** be controlled by 2-bins method?
 - Metal ring
 - Pivot
 - Spanner Wrench
 - No correct answer
- Which answer is **NOT** an advantage of decentralized maintenance organization?
 - Fast access of maintenance man
 - Maintenance man has good relationship with machine operator
 - Maintenance man has more free time
 - High skill of maintenance man

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Question 3. Answer questions in table “B” by using the words in table “A “ only. Some words can be used more than once. Some words may not be used. (1 point each, total 10 points)

Table “A”

ABC	Circuit breaker	CM
FIFO	MTBF	MTTR
Permanent store	Money	Spanner
2 bins	Non permanent store	TPM
Relay	MP	Gear box
EOQ	APQ	JIPM
IRR	SAP	Screw
QMS	PLC	Google.com
Bolts	Switch	CMMS

Table “B”

No	Question	Answer
1	The expensive materials with low downtime loss shall belong under this type of stores.	
2	The maintenance tools	
3	The system that is designed for maintenance management by using information technology in computer.	
4	This maintenance type is firstly introduced in Nippon Denso.	
5	The article prepared against sudden failure shall belong under this type of stores	
6	Mechanical spare part	
7	One example of maintenance management programs	
8	The life-predictable articles with low annual frequency of use shall belong under this type of stores.	
9	It provides an award for the organization that demonstrates good maintenance management.	
10	These assessments relate to overall equipment effectiveness.	

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Question 4 Lotus supermarket desires to establish TPM maintenance system in the store.

You are assigned to be a member of the team. Please answer these following questions.

All data can be assumed where necessary. (20 points)

1. What are the machines defined in “A” class? (Give 5 machines) (5 points)
2. Define a TPM policy (5 points)
3. Design the suitable maintenance organization (5 points)
4. Design Breakdown and Preventive procedure? (5 points)



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Part B: Asst. Prof. Dr.Thanate Ratanawilai (50 points)

Answer all 9 questions in this exam paper only.

Question#	1	2	3	4	5	6	7	8	9	Total
Full score	2	3	3	4	4	12	3	10	9	50
Score										

1. (2 points) How many questions in part B?

2. (3 points) What is the purpose of inspection?

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.....
.....
.....

3. (3 points) Inspections are generally classified by method, contents, and purpose. What are three types of inspection? Explain

3.1.....
.....

3.2.....
.....

3.3.....
.....



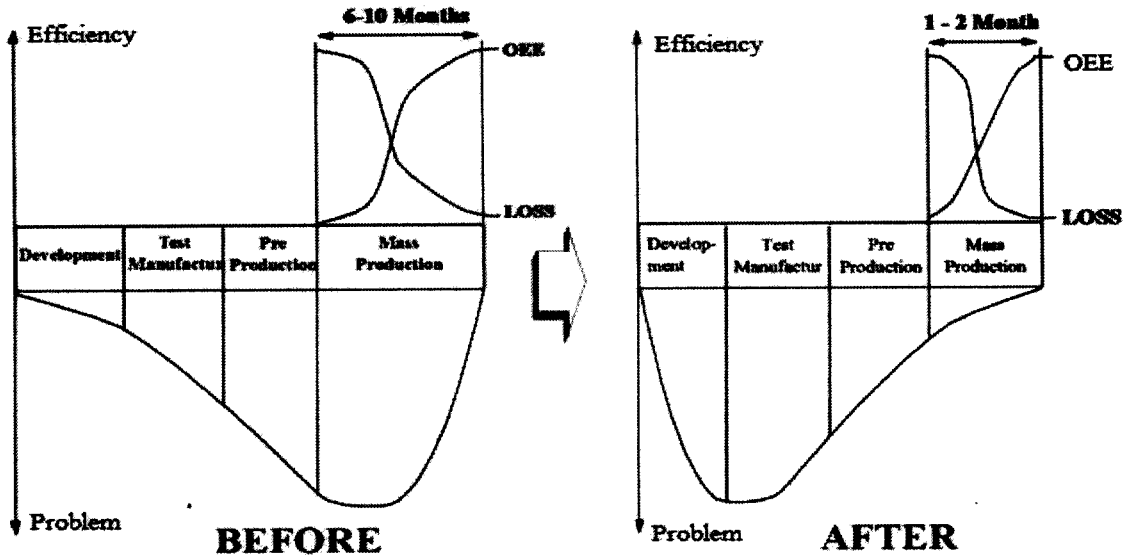
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4. (4 points) Draw a table to show your design of inspection standard.



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5. (4 points) Explain concept of initial control based on figure below.



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6. (12 points) Describe a concept of each technique.

Visual inspection

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Student name :code :

Liquid penetrant inspection

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Magnetic particle inspection

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Radiography

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Student name :code :

Eddy current testing

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Ultrasonic inspection

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7. (3 points) List the other methods of non-destructive testing (NDT) that was not shown in question 6.

7.1.....
7.2.....
7.3.....



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8. (10 points) CNC machine was used to make a product 6 day a week. The average production rate is 1400 pieces per week. The sale price of product is 1500 baht per piece and the profit is 400 baht each. The machine deterioration has occurred resulting in decreasing the productivity rate at 50 pieces per week whereas defect was found 45 pieces per week. The sale price of defected product is 1300 baht per piece. The maintenance manager would like to completely repair the CNC machine within 1 day however he still does not know how often to repair. As an engineer, please give the information to the manager for helping him to make the right decision based on 6 weeks of prediction.

Table below shows the amount of payment to repair (1000 baht). The longer period to repair, the higher cost to pay.

Number of weeks	1	2	3	4	5	6
Payment to repair (1000 baht)	20	30	40	50	60	70

1													
2													
3													
4													
5													
6													

Answer



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9. (9 points) In a small machine shop, there are 3 types of main machine including 7 turning machines, 5 milling machines, and 3 drilling machines. There is no organization chart, no machine history, and etc. As an engineer, explain in details how to apply preventive maintenance (starting from the beginning until obtaining the output) to this machine shop.

End of Part B : GOOD LUCK Asst. Prof. Dr.Thanate Ratanawilai

