

Student name : Code : Section :



PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Final Examination : Semester 1

Academic Year : 2010

Date : Aug 2, 2010

Time : 9.00-12.00

Subject : 225-349 Safety and Environmental Engineering

Room : A401

คำสั่ง

1. ข้อสอบมีทั้งหมด 4 ส่วน ในกระดาษคำตอบ 11 หน้า รวมหน้าปก (นับให้ครบก่อนลงมือทำ)
2. ห้ามการหยิบยืมสิ่งใด ๆ ทั้งสิ้น จากผู้อื่น ๆ เว้นแต่ผู้คุมสอบจะหยิบยืมให้
3. ห้ามนำส่วนใดส่วนหนึ่งของข้อสอบออกจากห้องสอบ
4. ผู้ที่ปฏิบัติเข้าข่ายทุจริตในการสอบ ตามประกาศคณะวิศวกรรมศาสตร์ มีโทษ คือ ปรับตกในรายวิชาที่ทุจริต และพักการเรียน 1 ภาคการศึกษา
5. ให้ทำในกระดาษคำตอบเท่านั้น ตอบนอกกระดาษ คำตอบไม่มีคะแนน
6. เขียน ชื่อ หรือรหัส ในกระดาษคำตอบทุกหน้าก่อนเริ่มทำ เพื่อป้องกันความสับสน ในกรณีกระดาษคำตอบหลุดจากฉบับ
7. ให้นักศึกษาสามารถนำสิ่งต่อไปนี้เข้าห้องสอบได้
 ตำรา หนังสือ กระดาษ A4 เขียนด้วยลายมือตนเอง 2 แผ่น
“ส่งกระดาษ A4 ทั้ง 2 แผ่นมาพร้อมกระดาษคำตอบด้วย”
 นำ Dictionary และ เครื่องคิดเลข เข้าห้องสอบได้ โดย ห้ามบันทึกเนื้อหาเกี่ยวกับวิชานี้
8. ให้ทำข้อสอบโดยใช้ ดินสอ ปากกา

Part#	1	2	3	4	Total
Full score	10	25	20	65	120
Score					

ผู้ออกข้อสอบ ผศ.ดร.กลางเดือน โพนนา


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Part 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			Fume is solid particle that is produced from welding process; the size of fume is normally larger than 1 micron.
2			The spray tower or scrubber is used for removal of small gas bubbles or water droplets from the air cooling tower of air condition system.
3			CO is poisonous and odorless. It is the product of incomplete combustion.
4			Smoke is entrained solids particles formed as a result of incomplete combustion of carbon materials.
5			“What-if” analysis is normally used for identifying hazard that may occur in the complex production process such as chemical reaction unit or petrol chemical process.
6			H ₂ S is the gas that has rotten egg odorless at low concentrations, and highly poisonous.
7			Incandescent lamp normally has longer life than Fluorescent lamp.
8			O ₃ is pure oxygen gas which is beneficial to vegetation and not damage to property.
9			FTA is the hazard identification tool that uses guideword to identify the occurred accident.
10			Spray can settle out under gravity.

Part 2 : Fill in the blanks by using the following words (25 points)

chemical reaction	Spray	wet scrubber	Mercury	ADC	IFR	SR	DI
Fluorescent	cyclone	and	or	logic gate	guide words	dust	bag filter
2	4	5	10	20	30	40	50
direct	indirect	Fault tree	Event tree	FMEA	HAZOP	JSA	fume
condensation	accident chain	danger	Near miss	atomization	injury	mist	smoke

1. Large particles in the air such as metal scrap, wood dust, etc. can be efficiently removed by using.....
2. The driver should drive forklift with the speed not more than km/hr.
3. During driving, the fork of forklift should be lifted not less thancm. and not more thancm.
4. Thediagram is usually written out using conventional logic gate symbols.
5.is one of the safety management tools that can be used to define and control the hazards associated with a certain process, job or procedure.
6. In order to identify Deviations, the analysis leader applies (systematically, in order) a set of Guide Words to each parameter for each section of the process.
7.  This symbol is used as an “.....” gate for fault tree analysis.
8. The relatively large solid particles, size of 0.1-25 micron, are called
9. is solid particle, a metallic oxide formed by the condensation of vapor by distillation, or chemical reaction processes.
10. Mist is liquid particle formed by the..... of vapors and perhaps by chemical reaction



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11. Spray is liquid particle formed by the of a parent liquid.
12. One of the most popular, economical, and effective means for controlling particulates is
13. The uses small gas bubbles or water droplets to capture contaminant from polluted air.
14. The fourth domino according to the Domino Theory is.....
15. The width of an office ladder should be at least feet.
16. The noise in an office should not more than dB.
17. lamp is suitably used for outdoor such as football field, warehouse, etc.
18. The Domino Theory is sometimes called.....
19. The cost of accident investigation is classified as.....cost.
20. According to H.W. Heinrich's finding, the indirect cost is normally.....times higher than the direct cost.
21. The accident cause from natural incident, which is so called "acts of God", is normally%
22. The cost of compensation is classified ascost.
23. The accident prevention cost is classified ascost.
24. The level of severity that is a consequence of hazard is called.....
25. The ratio of average days charged per accident is named.....



Question 3 : From the following news, consider whether these situations are unsafe act and/or unsafe condition. Preventive action on each situation must be suggested. (5 points each, total of 20 points)

#	News	Unsafe act	Unsafe condition	Preventive Action
1	An accident at the Merkur Supermarket in Baden, left 2 persons injured when a forklift truck brought down a large section of ceiling while attempting to load heavy goods at height.			
2	A self-employed flooring contractor was working on the renovation of an airbridge when he fell 3 metres through its floor. The floor covering had been lifted but the underlying subfloor was found to be rotten, and an employee of ROK had lifted the plywood panels so that the only remaining floor was a thin, and poorly supported, metal sheet.			
3	The Department of Labour is investigating an accident where a man died in an explosion while working on an old 5K-litre petrol tank at the Petroleum Services' dangerous goods depot in Hamilton, the yard stores several former petrol station tanks, the tank which exploded was marked "cut for scrap" but had not been completely drained			

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#	News	Unsafe act	Unsafe condition	Preventive Action
4	<p>of fuel.</p> <p>The captain of the tourist boat which sank on Lake Ohrid on Saturday with the loss of 15 lives has been arrested and remanded in custody for 30 days, following interrogation his assistant has not been detained. The vessel sank 300 metres offshore where it broke in two, 42 passengers survived. It was registered to carry 45 people, but 57 were on board, allegedly it was equipped with just 2 life jackets.</p>			

Part 4: Answer these following questions. Each question has different score.(65 points)

1. According to the news below, answer the following questions. (10 points)

Accident News: At the Newport inquest into the deaths of 2 teenagers by carbon monoxide poisoning verdicts of accident death were returned. The Deputy Gwent coroner heard evidence that 1 of the 18-year olds had applied a modification to the portable heater being used in an outbuilding which depressed a malfunctioning button in order to maintain flame. Tests revealed that this modification by-passed a safety cut-out. An engineer conducting an examination of the heater, which had faulty burners emitting dangerous levels of CO, described it as being "in a poor state and with a malfunction", preventing adequate ventilation. It had been procured second-hand and had apparently lacked servicing within the 2 years of changing ownership.

1.1) What is the cause of the accident?

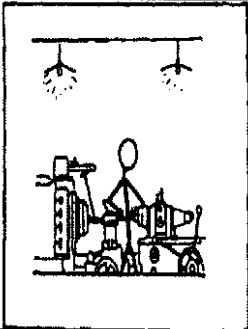
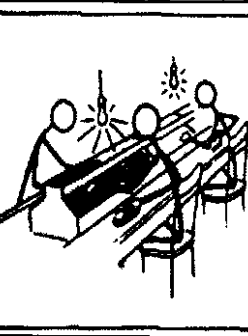
1.2) How can this accident be prevented?

2. What is the working environment which is the most suitable for Thai people? (5 points)

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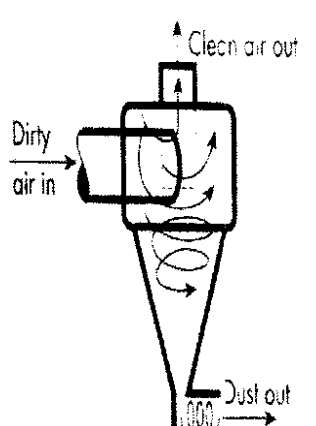
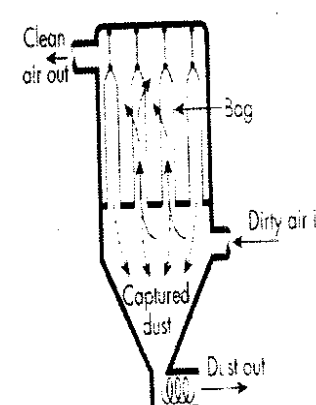
3. Anusha wants to renovate his office. Previously his interior designed his office without concerning about safety principle. What is your recommendation on his office wall, floor, and layout of the office furniture in the office? (5 points)

4. The following pictures show illumination system of a workshop, please give suggestion for improvement on the workplaces shown in the table. (10 points)

Workplace	Suggestion for improvement
	
	



5. How do these following devices work? Explain its application. (10 points)

Picture	Function and application
	
	

6. Why have both severe and minor accidents not been reported or recorded? (5 points)



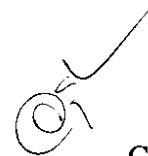
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7. Miss Nartnara wants to work in a seafood canning factory in the south of Thailand. She is interested in 3 factories, which are AA, BB, and CC. The accident records of each factory in 2009 shown in the following table. Nartnara seriously concerns about her safety. She wants to select the most safety workplace. According to the factories' accident records, which factory should be recommended for Nartnara? Reason with detail calculation must be shown. (10 points)

Records	AA	BB	CC
Total number of accidents	25	30	40
Total number of day charged	850	750	650
Total number of employees	200	250	300
Average working hours per employee per year	2400	2410	2450

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8. The accident occurred in the welding workshop last week. Mario was injured on his left hand figure. His figure got a minor burnt. The preliminary investigation was made. It was found that during his workshop he did not follow the instruction and he also did not wear any protection equipments. Please give advice according to 3E principle. (10 points)



Good luck!!!

Asst. Prof. Dr. Klangduen Pochana.