

Name _____ Student ID _____

Prince of Songkla University
Department of Industrial Engineering, Faculty of Engineering

Mid Term Examination: Semester 2
Date: 11 December 2005
Subject: 225-702 Modern Production Management

Academic Year: 2005
Time: 9:00-12:00
Room: R300

ทฤษฎีในการสอบ โทษขั้นต่ำ คือ ปรับตกในรายวิชาที่ทฤษฎี และพักการเรียนหนึ่งภาคการศึกษา

Instructions: Read carefully

1. All materials are allowed.
2. There are 6 problems. Do all of them. Also show your work clearly and legibly.
3. Answer the questions in this test paper, only.
4. You must write your name and your student ID in every page of the test.
5. Total score is 100 points.

Distribution of Score

Problem	Points	Points Gained
1	20	
2	20	
3	20	
4	20	
5	20	

Tests are prepared by
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Problem 1: (20 points) The following data represent company defect product.

Operator	Machine	Monday	Tuesday	Wednesday	Thursday	Friday
A	Machine 1	●●●●	●●●●●	●●●●●	●●●●	●●●●●
		**	*	*****	*	*
		○○	○○○	○○○○	○○○	○○○○
		⊗⊗	⊗	⊗⊗	⊗⊗	⊗⊗⊗
		⊕		⊕		
	Machine 2	●●	●●●	●●●	●●	●●
		*	**	*****	*	**
		○	○○	○○	○	○
				⊗	⊗	⊗
			⊕			
B	Machine 3	●●	●●●●	●●●	●●●	●●●●
		**	*	*****	*	*
		○	○	○	○	○○
		⊗		⊗	⊗	⊗
					⊕	
	Machine 4	●●	●●●	●●●	●●●	●●
		*	*	****	*	*
		○○	○	○○		○○
			⊗	⊗	⊗	⊗
		⊕				

From above data, analyze and define problems.

Problem 2: (20 points) The following data collected from an inspection line for contaminated substances in block rubber products, having four inspectors.

Date	Amount Inspection (units)	Inspector 1 (grams)	Inspector 2 (grams)	Inspector 3 (grams)	Inspector 4 (grams)
3	5940	1.5806	7.1835	2.4314	2.3560
4	5616	0.8990	6.8918	3.0719	5.2010
5	1692	0.4780	1.2956	1.0761	1.3932
6	1944	0.3534	2.0732	2.0340	1.5087
10	2376	0.8789	1.7925	5.3685	3.9731
11	2736	2.3904	2.5846	5.8484	5.3005
12	3024	4.5400	2.0286	3.1794	1.6015
13	3060	0.9972	3.3965	1.3843	3.0346
17	5112	1.2890	3.5424	5.7270	4.9366
18	4500	1.1426	3.1087	2.2360	3.9852
19	4248	1.3920	2.7664	1.3245	2.3292
20	3456	0.6913	2.3549	3.2355	2.6280
24	6912	1.1482	2.5945	3.2427	3.3464
25	6624	1.3065	3.5039	5.6282	3.5155
26	6516	2.0431	4.3245	7.7333	3.9903
27	6336	2.9835	3.6863	7.5543	5.8578
28	5940	2.0481	5.0058	4.6054	4.5923

From the above data, how many are there the average per day (in grams) of contaminated substances in block rubber products?

Problem 3: (20 points) From data in problem 2, are there significant differences between the inspectors in the performance of inspection? Assume each inspector inspects the product in the same quantity.



Use the appropriate statistical tool to answer the following questions:

- (a) Illustrate the variation in number of outpatients.
- (b) Can you state that the average number of outpatients, who arrive at the hospital during 08.00 - 10.00, is equal 36 persons.

Problem 5: (20 points) The industrial engineer are studying a specific problem, relating to process in chemical industry. Burning times of chemical flares is a chosen quality characteristic. He is in the stage of root cause analysis and he is interested in whether formulation is the root cause of the burning times or not. He conducted experiment and collected data as shown below. If you were this industrial engineer, what are your conclusions for this analysis? ($\alpha = 0.05$)

Formulation 1		Formulation 2	
65	82	64	56
81	67	71	69
57	59	83	74
66	75	59	82
82	70	65	79