PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Final Examination: Semester II — Academic Year: 2013
Date: March 6, 2014 — Time: 13:30-16:30.
Subject: 225-503 Production Systems & Management — Room: A401

Instructions

- There are 5 questions in 4 pages (include this cover page)
- Answer all 5 questions in the *answer-book* provided
- Open-book exam. All materials, books, papers, calculators and dictionaries are allowed.
- Total score is 100

Questions	Full Score	Assigned Score
Q1	20	
Q2	20	
Q3	25	
Q4	15	
Q5	20	
Total	**100**	

Assoc. Prof. Somchai Chuchom

ทุจริตในการสอบ โทษขั้นต่ำคือ ปรับตกในรายวิชาที่ทุจริต และพักการเรียน 1 ภาคการศึกษา

Question 2 (20 marks)

2-1) How is a pull system distinguished from a push system in production and inventory control?

2-2) Explain the concepts of the TPS (Toyota Production System) and show the details of tools or sub-systems that support the implementation of TPS successfully.

Question 3 (25 marks)

This LP model was solved by computer:

Maximize $15x_1 + 20x_2 + 14x_3$ where x_1 = quantity of product 1

x_2 = quantity of product 1

x_3 = quantity of product 1

subject to

Labor	$5x_1 + 6x_2 + 4x_3 \leq$	210 hours	
Material	$10x_1 + 8x_2 + 5x_3$	$\leq$	200 kilograms
Machine	$4x_1 + 2x_2 + 5x_3 \leq$	170 minutes	
	x_1, x_2, x_3	$\geq$	0

The following information was obtained from the output report.

Total profit = 548.00

Variable	Final Value	Reduced Cost	Objective Coefficient	Allowable Increase	Allowable Decrease
Product 1	0	-10.6	15	10.6	1E+30
Product 2	5	0	20	2.4	10.6
Product 3	32	0	14	36	1.5

Constraint	Final Value	Shadow Price	Constraint R.H. Side	Allowable Increase	Allowable Decrease
Labor	158	0	210	1E+30	52
Material	200	2.4	200	70.91	30
Machine	170	0.4	170	30	120

Answer the following questions

3.1 Which decision variables are basic?

3.2 Which constraints are binding for optimal solutions?

3.3 If the profit per unit of product 2 increased by $2 (to be $22), would the optimal value of the objective function change? Why?

3.4 If the available amount of material decreased by 30 kilograms, how would that affect the optimal value of the objective function?

3.5 If profit per unit on product 2 increased by $1 and profit per unit on product 3 decreased by $1, would the optimal value of the decision variables change? Why?

3.6 Determine the 'Range of Optimality' for product 1, 2, and 3.

Question 4 (15 marks)

Explain the principles of the SMED (single-minute exchange of die) and show the case that applied SMED successfully.

Question 5 (20 marks)

Choose ***only one*** topic from the list below and explain in details on the selected topic to show that it is a useful tool for decision making in management system for manufacturing, and discuss on the reviewed papers or related work if possible. The lists of topics are:

5-1) Forecasting

5-2) Inventory Management

5-3) Management of Quality

5-4) Motivating and Training employees

5-5) Allocating facilities

Question 1 (20 marks)

1.1 What is group technology?

1.2 What are the production conditions under which group technology and cellular manufacturing are most applicable?

1.3 What are the two tasks that a company must undertake when it implements group technology?

1.4 Using the information given in Figure 1 to develop the form code (first five digits) in the Opitz System for the part illustrated in Figure 2.

	Digit 1	Digit 2	Digit 3	Digit 4	Digit 5
	Part class	External shape, external shape elements	Internal shape, internal shape elements	Plane surface machining	Auxiliary holes and gear teeth
Rotational parts	L/D 0.5	0 Smooth, no shape elements	0 No hole, no breakthrough	0 No surface machining	0 No auxiliary hole
	0.5 < L/D < 3	1 No shape elements	1 No shape elements	1 Surface plane and/or curved in one direction, external	1 Axial, not on pitch circle diameter
	L/D 3	2 Stepped to one end or smooth: Thread	2 Smooth or stepped to one end: Thread	2 External plane surface related by graduation around the circle	2 Axial on pitch circle diameter
		3 Stepped to one end or smooth: Functional groove	3 Smooth or stepped to one end: Functional groove	3 External groove and/or slot	3 Radial, not on pitch circle diameter
		4 Stepped to both ends: No shape elements	4 Stepped to both ends: No shape elements	4 External spline (polygon)	4 Axial and/or radial and/or other direction
		5 Stepped to both ends: Thread	5 Stepped to both ends: Thread	5 External plane surface and/or slot, external spline	5 Axial and/or radial on PCD and/or other directions
		6 Stepped to both ends: Functional groove	6 Stepped to both ends: Functional groove	6 Internal plane surface and/or slot	6 Spur gear teeth
Nonrotational parts		7 Functional cone	7 Functional cone	7 Internal spline (polygon)	7 Bevel gear teeth
		8 Operating thread	8 Operating thread	8 Internal and external polygon, groove and/or slot	8 Other gear teeth
		9 All others	9 All others	9 All others	9 All others

(Digit 5: 0–5 No gear teeth; 6–8 With gear teeth; 9 All others)

Figure 1

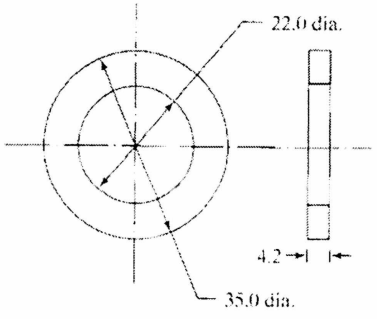

Figure 2 (Dimensions are in millimeters)