รายการอ้างอิง

ภาษาไทย

เกษมศักดิ์ มิตรเกษม. การประยุกต์ใช้กระบวนการลำดับชั้นเชิงวิเคราะห์ ในการเลือกทำเลที่ตั้งโรงงาน, วิทยานิพนธ์ปริญญามหาบัณฑิต จุฬาลงกรณ์มหาวิทยาลัย, 2536.

ชูเวช ชาญสง่าเวช. เอกสารประกอบการบรรยายวิชา การวิเคราะห์การตัดสินใจในงานวิศวกรรม, กรุงเทพมหานคร : ภาควิชาวิศวกรรมอุตสาหการ คณะวิศวกรรมศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย.

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ภาคผนวก ก.

แบบสอบถามสำหรับหาน้ำหนักปัจจัยหลัก

QUESTIONNAIRE

Concerning Master's Degree Thesis

Selection of EGAT's Control System Bidder by Analytical Hierarchy Process Method

by

Mr. Sukit Angsuwan

Objective: The gathered information will be analyzed for evaluation control system setting weight of main criteria which used to select the optimal Control System bidders

Thesis Advisor : Ass. Prof. Suthas Ratanakuakangwan

Thesis Co. Advisor: Mr. Vudtichai Eksangsri
Director of Electrical and Control system Engineering Department

Industrial Engineering Division
Engineering Faculty
Chulalongkorn University

Introduction

The purpose of this survey is to collect information to weight main factors considered criteria for selecting control system bidders .

The information collected from this questionnaire will be kept confidential and not be used for any purpose other than serving as the reference material for Master's Thesis study.

This questionnaire of 5 questions, please be frank open-minded and read carefully before choosing a appropriate answer to each question. Your participation in this study is highly appreciated.

Questionnaire

Selection of EGAT's Control System Bidders by Analytical Hierarchy Process Method.

From investigation , the control system bidders selection can be influenced by the following main factors:

1. **Technical** based on :-

   - Control system hardware
   - Control system software

2. **Offered price**

3. **Project management** based on :-

   - Schedule
   - Term of payment
   - Manufacturer's service (Technical & Field service)
   - Warranty (Design, Materials, Equipment)
   - Training

4. **Document** based on :-

   - Proposal Document
   - Design and instruction document

5. **Capability of bidder** based on :-

   - Experience
   - Staff
   - Organization

1) From the 5 main factors for selection control system mentioned, in your opinion, which factor is more important. Please rank them (ranking 1 means the most important factor and 5 means the least important. If there are equal important factors, please rank them in the same ranking).

ranking	(1)	(2)	(3)	(4)	(5)
Technical	( )	( )	( )	( )	( )
Offered Price	( )	( )	( )	( )	( )
Project Management	( )	( )	( )	( )	( )
Document	( )	( )	( )	( )	( )
Capability of Bidder	( )	( )	( )	( )	( )

2) Comparing the importance between ranking no.1 to ranking no.2 . In your opinion, what is the intensity of importance of ranking no.1 relative to ranking no.2 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.2

3) In your opinion, what is the intensity of importance of ranking no.1 relative to ranking no.3 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.3

4) In your opinion, what is the intensity of importance of ranking no.1 relative to ranking no.4 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.4

5) In your opinion, what is the intensity of importance of ranking no.1 relative to ranking no.5 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.5

ภาคผนวก ข.

แบบสอบถามสำหรับหาน้ำหนักปัจจัยย่อย และเปรียบเทียบคุณสมบัติของผู้เข้าประมูล

QUESTIONNAIRE

Concerning Master's Degree Thesis

Selection of EGAT's Control System Bidder by Analytical Hierarchy Process Method

by

Mr. Sukit Angsuwan

Objective: The gathered opinion of experts in control system will be analyzed for evaluation control system setting weight of sub-criteria used and comparison the alternatives in each criteria to select the optimal Control System bidders

Thesis Advisor : Ass. Prof. Suthas Ratanakuakangwan

Thesis Co. Advisor: Mr. Vudtichai Eksangsri
Director of Electrical and Control system Engineering Department

Industrial Engineering Division
Engineering Faculty
Chulalongkorn University

Introduction

The purpose of this survey is to collect information to weight all of considered sub-criteria and comparing the alternatives in each criteria for selecting control system bidders for case study project.

The information collected from this questionnaire will be kept confidential and not be used for any purpose other than serving as the reference material for Master's Thesis study.

This questionnaire of 35 questions, please be frank open-minded and read carefully before choosing a appropriate answer to each question. Your participation in this study is highly appreciated.

Questionnaire

Selection of EGAT's Control System Bidders by Analytical Hierarchy Process Method.

From investigation , the control system for case study project bidders selection can be influenced by the following criteria and sub-criteria :-

(Note : The drawing shown configuration of control system is attached)

1. Technical

1.1 Hardware based on :-

-Programmable Logic Controller (PLC)
(PLC, Communication Devices)

-Computer work stations

-Engineering work stations

-Computer accessories
(Color printer, B/W printer)

-Instrumentation
(Natural gas alarm, Infrared camera system, Weather station, Pressure & Flow measurement, Vibration system)

-Furniture / Miscellaneous
(Work station desks, Printer stands, Audible Alarm)

1.2 Software based on :-

-Man-to-machine interface Programming (MMI)

-Expert system programming (EXPERT)
(Automation/Guidance, Emergency operation guidance)

-PLC programming (PLC PRG)

2. Offered price

3. Project management based on:-

-Schedule

-Term of payment (PAYMENT)

-Manufacturer's service (SERVICE)
(Technical & Field service)

-Warranty
(Design, Materials, Equipment)

-Training

4. Document based on :-

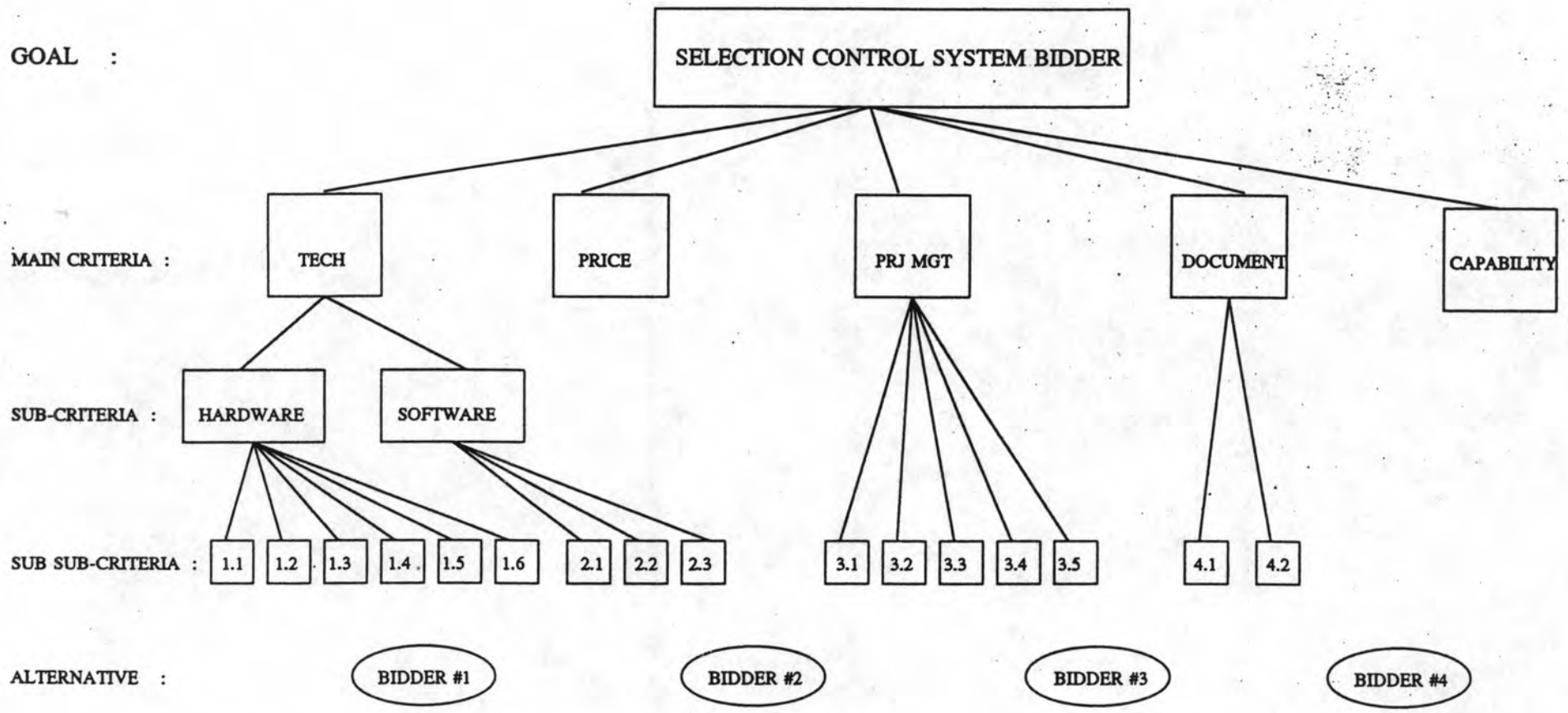
-Proposal Document (PROP. DOC)

-Design and instruction document (DESIGN & -INSTRUCT DOC.)

5. Capability of bidder
(Experience, Staff ,Organization)

There are 4 bidder proposals considered to be evaluated as follows:

1. Bidder no.1
2. Bidder no.2
3. Bidder no.3
4. Bidder no.4



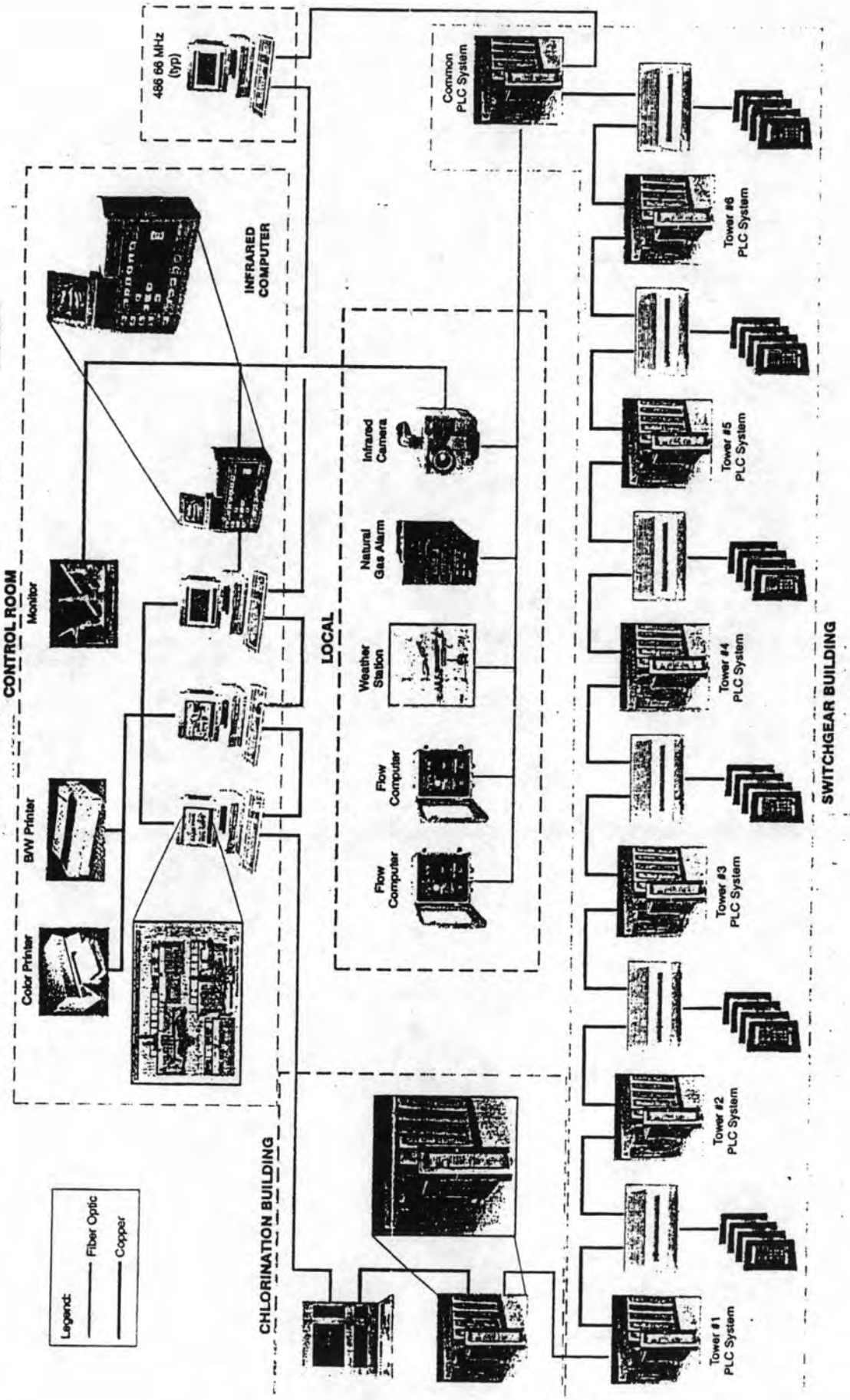
TECH : TECHNICAL
PRICE : OFFERED PRICE
PRJ. MGT. : PROJECT MANAGEMENT
DOCUMENT : DOCUMENT
CAPABILITY : CAPABILITY OF BIDDER

1.1 Programmable Logic Controller
1.2 Computer work stations
1.3 Engineering work stations
1.4 Computer accessories
1.5 Instrumentation
1.6 Furniture / Miscellaneous

2.1 Man-to-machine interface Programming
2.2 Expert system programming
2.3 PLC programming

3.1 Schedule
3.2 Term of payment
3.3 Manufacturer's service
3.4 Warranty
3.5 Training

4.1 Proposal Document
4.2 Design and instruction document


486 66 MHz (typ)
Common PLC System
INFRARED COMPUTER
CONTROL ROOM
Monitor
B/W Printer
Color Printer
LOCAL
Infrared Camera
Natural Gas Alarm
Weather Station
Flow Computer
Flow Computer
Tower #6 PLC System
Tower #5 PLC System
Tower #4 PLC System
Tower #3 PLC System
Tower #2 PLC System
Tower #1 PLC System
SWITCHGEAR BUILDING
CHLORINATION BUILDING
Legend:
Fiber Optic
Copper

Section 1 Setting weight of sub-criteria

- Weight for Technical

1.1) From Hardware and Software Sub-Criteria of Technical for selection control system, in your opinion, which factor is more important. Please rank them (ranking 1 means the most important factor and 2 means the less important. If there are equal important factors, please rank them in the same ranking).

ranking	(1)	(2)
Hardware	( )	( )
Software	( )	( )

1.2) Comparing the importance between ranking no.1 to ranking no.2 . In your opinion, what is the intensity of importance of ranking no.1 relative to ranking no.2 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.2

- Weight for Hardware Sub-criteria

1.3) From the 6 hardware sub-criteria of Technical factor for selection control system, in your opinion, which factor is more important. Please rank them (ranking 1 means the most important factor and 6 means the least important. If there are equal important factors, please rank them in the same ranking).

ranking	(1)	(2)	(3)	(4)	(5)	(6)
PLC	( )	( )	( )	( )	( )	( )
Computer work station	( )	( )	( )	( )	( )	( )
Engineering work station	( )	( )	( )	( )	( )	( )
Computer accessories	( )	( )	( )	( )	( )	( )
Instrumentation	( )	( )	( )	( )	( )	( )
Furniture/Miscellaneous	( )	( )	( )	( )	( )	( )

1.4) Comparing the importance between ranking no.1 to ranking no.2 . In your opinion, what is the intensity of importance of ranking no.1 relative to ranking no.2 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.2

1.5) In your opinion, what is the intensity of importance of ranking no.1 relative to ranking no.3 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.3

1.6) In your opinion, what is the intensity of importance of ranking no.1 relative to ranking no.4 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.4

1.7) In your opinion, what is the intensity of importance of ranking no.1 relative to ranking no.5 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.5

1.8) In your opinion, what is the intensity of importance of ranking no.1 relative to ranking no.6 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.6

- Weight for Software sub-criteria

1.9) From the 3 software sub-criteria of Technical factor for selection control system mentioned, in your opinion, which factor is more important. Please rank them (ranking 1 means the most important factor and 3 means the least important. If there are equal important factors, please rank them in the same ranking).

ranking	(1)	(2)	(3)
Man-to-machine interface Programming (MMI)	( )	( )	( )
Expert system programming	( )	( )	( )
PLC programming	( )	( )	( )

1.10) Comparing the importance between ranking no.1 to ranking no.2 . In your opinion, what is the intensity of importance of ranking no.1 relative to ranking no.2 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.2

1.11) In your opinion, what is the intensity of importance of ranking no.1 relative to ranking no.3 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.3

- Weight for Project Management

1.12) From the 5 sub-criteria of project management factor for selection control system, in your opinion, which factor is more important. Please rank them (ranking 1 means the most important factor and 5 means the least important. If there are equal important factors, please rank them in the same ranking).

ranking	(1)	(2)	(3)	(4)	(5)
Schedule	( )	( )	( )	( )	( )
Term of payment	( )	( )	( )	( )	( )
Manufacturer's service	( )	( )	( )	( )	( )
Warranty	( )	( )	( )	( )	( )
Training	( )	( )	( )	( )	( )

1.13) Comparing the importance between ranking no.1 to ranking no.2 . In your opinion, what is the intensity of importance of ranking no.1 relative to ranking no.2 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.2

1.14) In your opinion, what is the intensity of importance of ranking no.1 relative to ranking no.3 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.3

1.15) In your opinion, what is the intensity of importance of ranking no.1 relative to ranking no.4 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.4

1.16) In your opinion, what is the intensity of importance of ranking no.1 relative to ranking no.5 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.5

- Weight for Document

1.17) From Proposal document and Design & instruction document Sub-Criteria of Document factor for selection control system, in your opinion, which factor is more important. Please rank them (ranking 1 means the most important factor and 2 means the less important. If there are equal important factors, please rank them in the same ranking).

ranking	(1)	(2)
Proposal document	( )	( )
Design&instruction doc.	( )	( )

1.18) Comparing the importance between ranking no.1 to ranking no.2 . In your opinion, what is the intensity of importance of ranking no.1 relative to ranking no.2 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.2

Section 2 Comparison of Alternative Bidders to each criteria

-Comparison of Alternative Bidders for Hardware

2.1) In your opinion, which of the following bidders has more benefit in PLC proposed ?

	ranking (1)	(2)	(3)	(4)
Bidder no.1	( )	( )	( )	( )
Bidder no.2	( )	( )	( )	( )
Bidder no.3	( )	( )	( )	( )
Bidder no.4	( )	( )	( )	( )

And what is the intensity of benefit offered of bidder ranking no.1 relative to bidder ranking no.2 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.2

2.2) In your opinion, which of the following bidders has more benefit in Computer work station proposed ?

	ranking (1)	(2)	(3)	(4)
Bidder no.1	( )	( )	( )	( )
Bidder no.2	( )	( )	( )	( )
Bidder no.3	( )	( )	( )	( )
Bidder no.4	( )	( )	( )	( )

And what is the intensity of benefit offered of bidder ranking no.1 relative to bidder ranking no.2 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.2

2.3) In your opinion, which of the following bidders has more benefit in Engineering work station proposed ?

	ranking (1)	(2)	(3)	(4)
Bidder no.1	( )	( )	( )	( )
Bidder no.2	( )	( )	( )	( )
Bidder no.3	( )	( )	( )	( )
Bidder no.4	( )	( )	( )	( )

And what is the intensity of benefit offered of bidder ranking no.1 relative to bidder ranking no.2 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.2

2.4) In your opinion, which of the following bidders has more benefit in Computer accessories proposed ?

ranking	(1)	(2)	(3)	(4)
Bidder no.1	( )	( )	( )	( )
Bidder no.2	( )	( )	( )	( )
Bidder no.3	( )	( )	( )	( )
Bidder no.4	( )	( )	( )	( )

And what is the intensity of benefit offered of bidder ranking no.1 relative to bidder ranking no.2 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.2

2.5) In your opinion, which of the following bidders has more benefit in Instrumentation proposed ?

ranking	(1)	(2)	(3)	(4)
Bidder no.1	( )	( )	( )	( )
Bidder no.2	( )	( )	( )	( )
Bidder no.3	( )	( )	( )	( )
Bidder no.4	( )	( )	( )	( )

And what is the intensity of benefit offered of bidder ranking no.1 relative to bidder ranking no.2 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.2

2.6) In your opinion, which of the following bidders has more benefit in Furniture/Miscellaneous proposed ?

ranking	(1)	(2)	(3)	(4)
Bidder no.1	( )	( )	( )	( )
Bidder no.2	( )	( )	( )	( )
Bidder no.3	( )	( )	( )	( )
Bidder no.4	( )	( )	( )	( )

And what is the intensity of benefit offered of bidder ranking no.1 relative to bidder ranking no.2 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.2

-Comparison of Alternative Bidders for Software

2.7) In your opinion, which of the following bidders has more benefit in Man-to-machine interface programming (MMI) proposed ?

ranking	(1)	(2)	(3)	(4)
Bidder no.1	( )	( )	( )	( )
Bidder no.2	( )	( )	( )	( )
Bidder no.3	( )	( )	( )	( )
Bidder no.4	( )	( )	( )	( )

And what is the intensity of benefit offered of bidder ranking no.1 relative to bidder ranking no.2 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.2

2.8) In your opinion, which of the following bidders has more benefit in Expert system programming proposed ?

ranking	(1)	(2)	(3)	(4)
Bidder no.1	( )	( )	( )	( )
Bidder no.2	( )	( )	( )	( )
Bidder no.3	( )	( )	( )	( )
Bidder no.4	( )	( )	( )	( )

And what is the intensity of benefit offered of bidder ranking no.1 relative to bidder ranking no.2 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.2

2.9) In your opinion, which of the following bidders has more benefit in PLC programming proposed ?

	ranking	(1)	(2)	(3)	(4)
Bidder no.1		( )	( )	( )	( )
Bidder no.2		( )	( )	( )	( )
Bidder no.3		( )	( )	( )	( )
Bidder no.4		( )	( )	( )	( )

And what is the intensity of benefit offered of bidder ranking no.1 relative to bidder ranking no.2 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.2

- Comparison of Alternative bidders for Project Management

2.10) In your opinion, which of the following bidders has more benefit in Schedule proposed ?

	ranking	(1)	(2)	(3)	(4)
Bidder no.1		( )	( )	( )	( )
Bidder no.2		( )	( )	( )	( )
Bidder no.3		( )	( )	( )	( )
Bidder no.4		( )	( )	( )	( )

And what is the intensity of benefit offered of bidder ranking no.1 relative to bidder ranking no.2 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.2

2.11) In your opinion, which of the following bidders has more benefit in Term of Payment ?

	ranking	(1)	(2)	(3)	(4)
Bidder no.1		( )	( )	( )	( )
Bidder no.2		( )	( )	( )	( )
Bidder no.3		( )	( )	( )	( )
Bidder no.4		( )	( )	( )	( )

And what is the intensity of benefit offered of bidder ranking no.1 relative to bidder ranking no.2 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.2

2.12) In your opinion, which of the following bidders has more benefit in Manufacturer's service ?

ranking	(1)	(2)	(3)	(4)
Bidder no.1	( )	( )	( )	( )
Bidder no.2	( )	( )	( )	( )
Bidder no.3	( )	( )	( )	( )
Bidder no.4	( )	( )	( )	( )

And what is the intensity of benefit offered of bidder ranking no.1 relative to bidder ranking no.2 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.2

2.13) In your opinion, which of the following bidders has more benefit in Warranty ?

ranking	(1)	(2)	(3)	(4)
Bidder no.1	( )	( )	( )	( )
Bidder no.2	( )	( )	( )	( )
Bidder no.3	( )	( )	( )	( )
Bidder no.4	( )	( )	( )	( )

And what is the intensity of benefit offered of bidder ranking no.1 relative to bidder ranking no.2 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.2

2.14) In your opinion, which of the following bidders has more benefit in Training ?

ranking	(1)	(2)	(3)	(4)
Bidder no.1	( )	( )	( )	( )
Bidder no.2	( )	( )	( )	( )
Bidder no.3	( )	( )	( )	( )
Bidder no.4	( )	( )	( )	( )

And what is the intensity of benefit offered of bidder ranking no.1 relative to bidder ranking no.2 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.2

- Comparison of Alternative bidders for Document

2.15) In your opinion, which of the following bidders has more benefit in Proposal Document ?

ranking	(1)	(2)	(3)	(4)
Bidder no.1	( )	( )	( )	( )
Bidder no.2	( )	( )	( )	( )
Bidder no.3	( )	( )	( )	( )
Bidder no.4	( )	( )	( )	( )

And what is the intensity of benefit offered of bidder ranking no.1 relative to bidder ranking no.2 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.2

2.16) In your opinion, which of the following bidders has more benefit in Design & instruction document ?

ranking	(1)	(2)	(3)	(4)
Bidder no.1	( )	( )	( )	( )
Bidder no.2	( )	( )	( )	( )
Bidder no.3	( )	( )	( )	( )
Bidder no.4	( )	( )	( )	( )

And what is the intensity of benefit offered of bidder ranking no.1 relative to bidder ranking no.2 ?

	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.2

- Comparison of Alternative bidders for Capability of Bidder

2.17) In your opinion, which of the following bidders has more benefit in Capability of bidder ?

	ranking	(1)	(2)	(3)	(4)
Bidder no.1		( )	( )	( )	( )
Bidder no.2		( )	( )	( )	( )
Bidder no.3		( )	( )	( )	( )
Bidder no.4		( )	( )	( )	( )

And what is the intensity of benefit offered of bidder ranking no.1 relative to bidder ranking no.2 ?

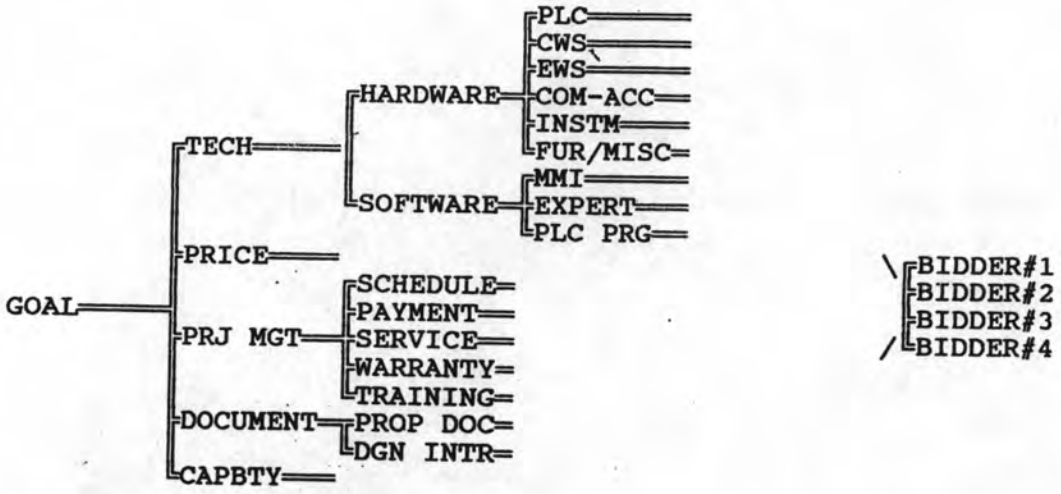
	Absolute		Very strong		Strong		Weak		
Ranking No.1	( )	( )	( )	( )	( )	( )	( )	( )	Ranking No.2

ภาคผนวก ค.

ผลการวิเคราะห์ข้อมูล โดยโปรแกรมสำเร็จรูป EXPERT CHOICE

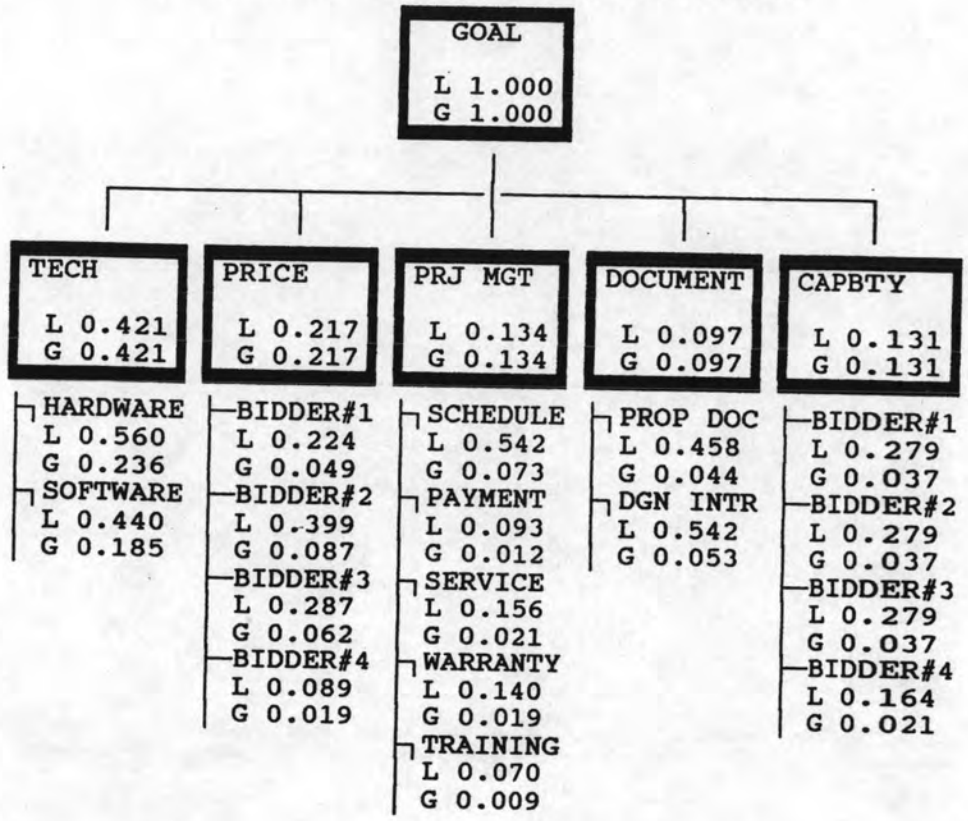
C:\EXPERT\ECMODELS\CONTROL1 Expert Choice Version 8.0

Selection of Control System bidders



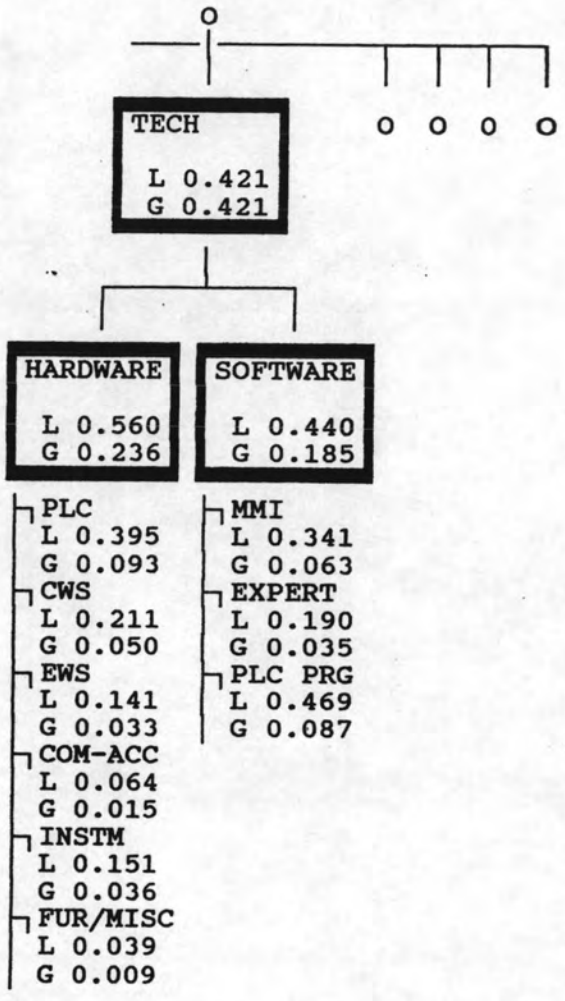
BIDDER#1 --- BIDDER NO.1
BIDDER#2 --- BIDDER NO.2
BIDDER#3 --- BIDDER NO.3
BIDDER#4 --- BIDDER NO.4
CAPBTY --- Capability of Bidder
COM-ACC --- Computer Accessories
CSI ALT1 --- Control System Int Alt#1
CSI ALT2 --- Control System Int Alt2
CSI BASE --- Control System Int Base bid
CWS --- Computer Work Station
DGN INTR --- Design & Instruction Document
DOCUMENT --- Document
EWS --- Engineering Work Station
EXPERT --- Expert System Programming
FUR/MISC --- Furniture / Miscellanceous
HARDWARE --- Hardware
INSTM --- Instrumentation
MANAGE --- Project Management
MMI --- Man-to -machine Interface Programming
PAYMENT --- Term of Payment
PLC --- Programmable Logic Controller
PLC PRG --- PLC Programming
PRICE --- Offering Price
PRJ MGT --- Project Management
PRJ MNGT --- Project Management
PROP DOC --- Proposal Document
SCHEDULE --- Schedule
SERVICE --- Manufacture's Service
SOFTWARE --- Software
TECH --- Technical
TRAINING --- Training
WARRANTY --- Warranty
WMEI --- Wunderlich-Malec Eng. Inc.

Selection of Control System bidders



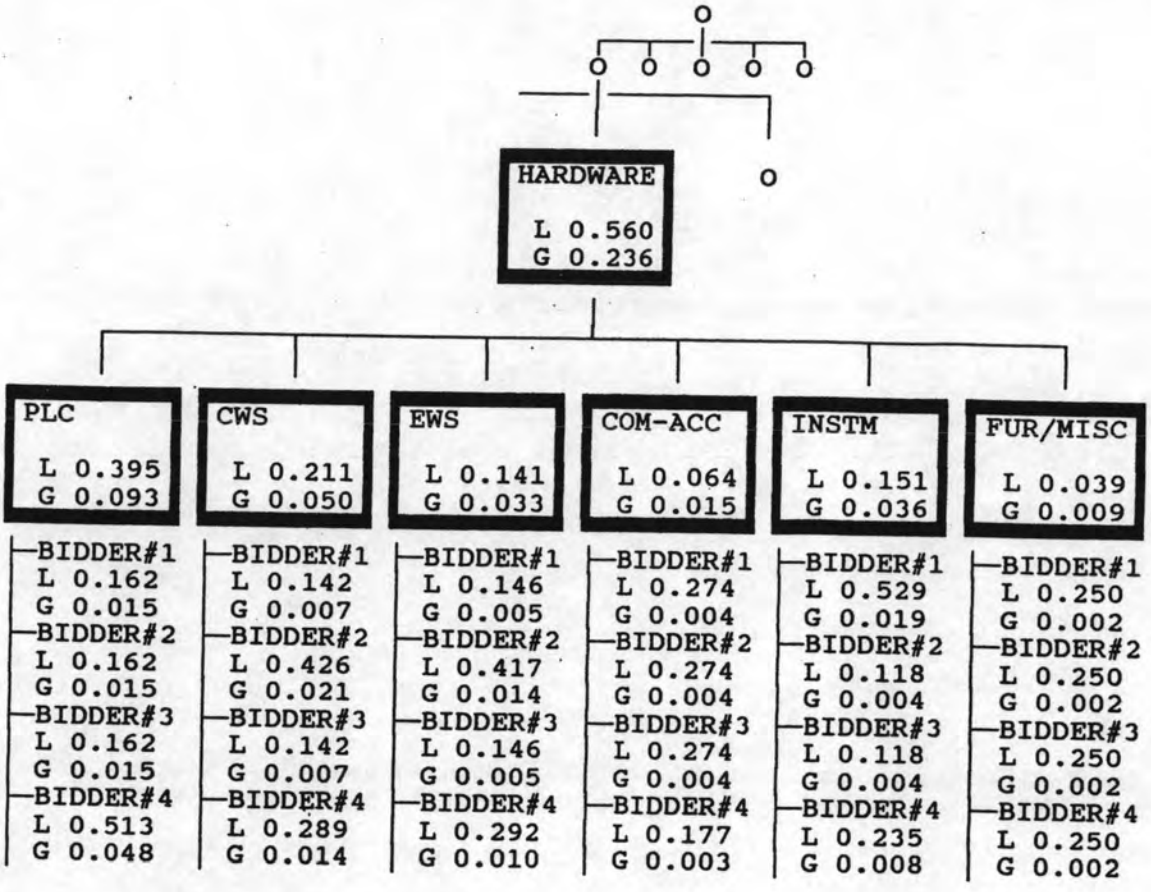
BIDDER#1 --- BIDDER NO.1
BIDDER#2 --- BIDDER NO.2
BIDDER#3 --- BIDDER NO.3
BIDDER#4 --- BIDDER NO.4
CAPBTY --- Capability of Bidder
DGN INTR --- Design & Instruction Document
DOCUMENT --- Document
HARDWARE --- Hardware
PAYMENT --- Term of Payment
PRICE --- Offering Price
PRJ MGT --- Project Management
PROP DOC --- Proposal Document
SCHEDULE --- Schedule
SERVICE --- Manufacture's Service
SOFTWARE --- Software
TECH --- Technical
TRAINING --- Training
WARRANTY --- Warranty

L --- LOCAL PRIORITY: PRIORITY RELATIVE TO PARENT
G --- GLOBAL PRIORITY: PRIORITY RELATIVE TO GOAL



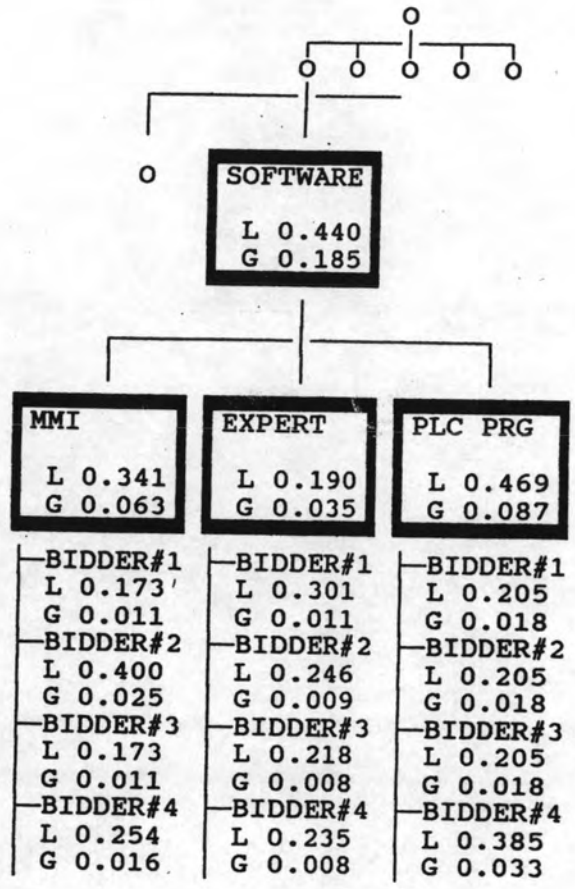
COM-ACC --- Computer Accessories
CWS --- Computer Work Station
EWS --- Engineering Work Station
EXPERT --- Expert System Programming
FUR/MISC --- Furniture / Miscellanceous
HARDWARE --- Hardware
INSTM --- Instrumentation
MMI --- Man-to -machine Interface Programming
PLC --- Programmable Logic Controller
PLC PRG --- PLC Programming
SOFTWARE --- Software
TECH --- Technical

L --- LOCAL PRIORITY: PRIORITY RELATIVE TO PARENT
G --- GLOBAL PRIORITY: PRIORITY RELATIVE TO GOAL



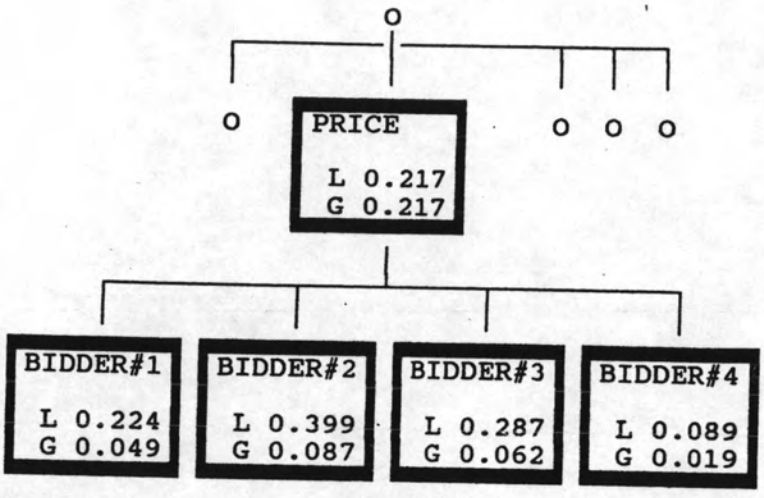
BIDDER#1 --- BIDDER NO.1
BIDDER#2 --- BIDDER NO.2
BIDDER#3 --- BIDDER NO.3
BIDDER#4 --- BIDDER NO.4
COM-ACC --- Computer Accessories
CWS --- Computer Work Station
EWS --- Engineering Work Station
FUR/MISC --- Furniture / Miscellanceous
HARDWARE --- Hardware
INSTM --- Instrumentation
PLC --- Programmable Logic Controller

L --- LOCAL PRIORITY: PRIORITY RELATIVE TO PARENT
G --- GLOBAL PRIORITY: PRIORITY RELATIVE TO GOAL



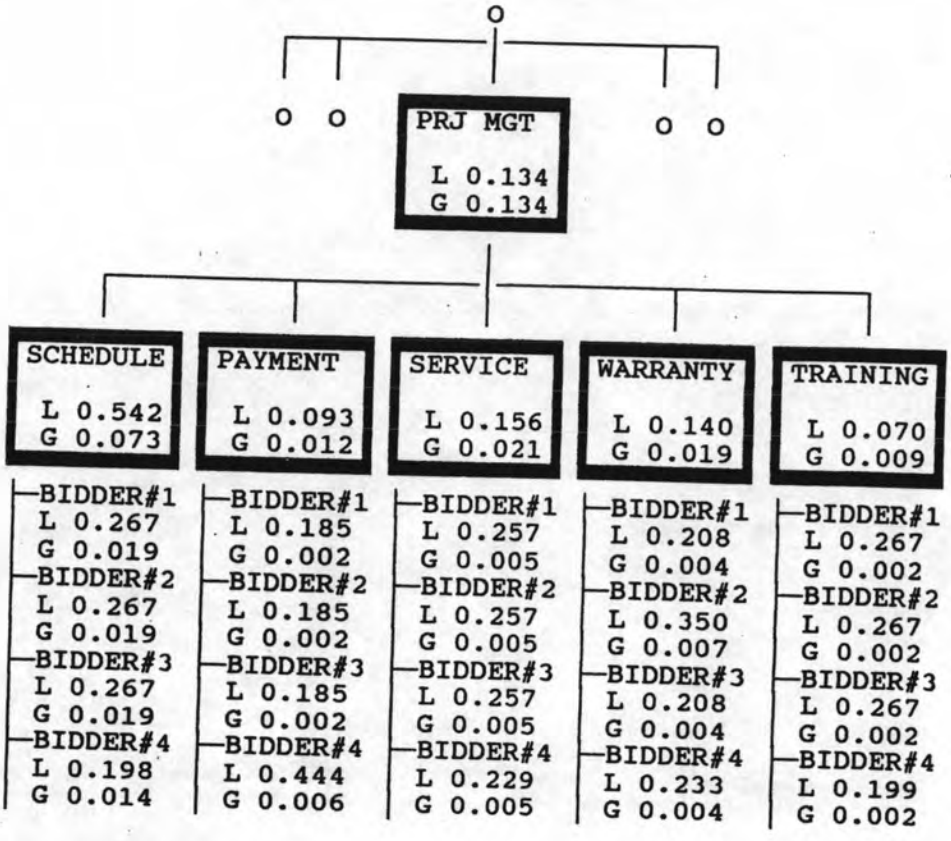
BIDDER#1 --- BIDDER NO.1
BIDDER#2 --- BIDDER NO.2
BIDDER#3 --- BIDDER NO.3
BIDDER#4 --- BIDDER NO.4
EXPERT --- Expert System Programming
MMI --- Man-to -machine Interface Programming
PLC PRG --- PLC Programming
SOFTWARE --- Software

L --- LOCAL PRIORITY: PRIORITY RELATIVE TO PARENT
G --- GLOBAL PRIORITY: PRIORITY RELATIVE TO GOAL



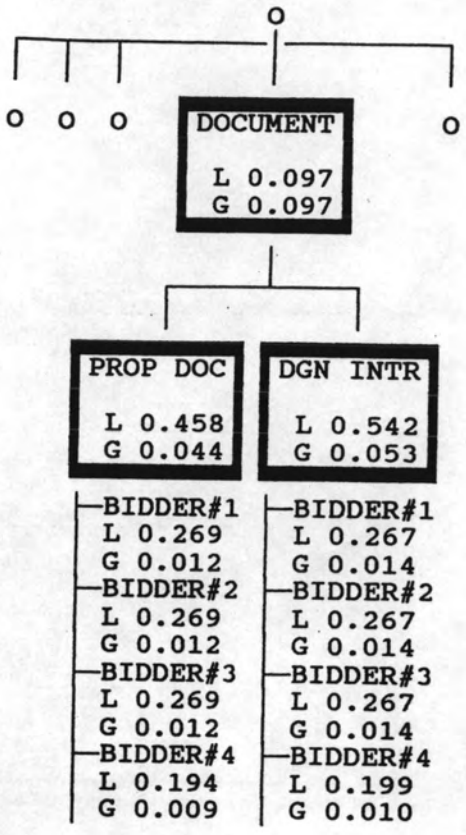
BIDDER#1 --- BIDDER NO.1
BIDDER#2 --- BIDDER NO.2
BIDDER#3 --- BIDDER NO.3
BIDDER#4 --- BIDDER NO.4
PRICE --- Offering Price

L --- LOCAL PRIORITY: PRIORITY RELATIVE TO PARENT
G --- GLOBAL PRIORITY: PRIORITY RELATIVE TO GOAL



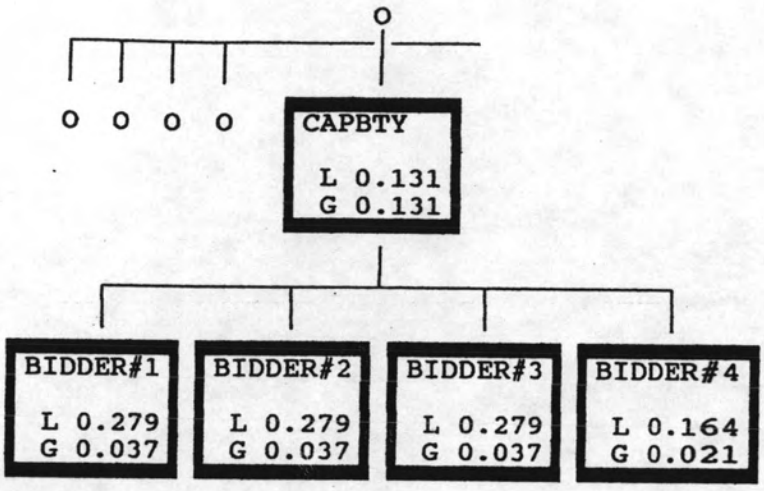
BIDDER#1 --- BIDDER NO.1
BIDDER#2 --- BIDDER NO.2
BIDDER#3 --- BIDDER NO.3
BIDDER#4 --- BIDDER NO.4
PAYMENT --- Term of Payment
PRJ MGT --- Project Management
SCHEDULE --- Schedule
SERVICE --- Manufacture's Service
TRAINING --- Training
WARRANTY --- Warranty

L --- LOCAL PRIORITY: PRIORITY RELATIVE TO PARENT
G --- GLOBAL PRIORITY: PRIORITY RELATIVE TO GOAL



BIDDER#1 --- BIDDER NO.1
BIDDER#2 --- BIDDER NO.2
BIDDER#3 --- BIDDER NO.3
BIDDER#4 --- BIDDER NO.4
DGN INTR --- Design & Instruction Document
DOCUMENT --- Document
PROP DOC --- Proposal Document

L --- LOCAL PRIORITY: PRIORITY RELATIVE TO PARENT
G --- GLOBAL PRIORITY: PRIORITY RELATIVE TO GOAL



BIDDER#1 --- BIDDER NO.1
BIDDER#2 --- BIDDER NO.2
BIDDER#3 --- BIDDER NO.3
BIDDER#4 --- BIDDER NO.4
CAPBTY --- Capability of Bidder

L --- LOCAL PRIORITY: PRIORITY RELATIVE TO PARENT
G --- GLOBAL PRIORITY: PRIORITY RELATIVE TO GOAL

Selection of Control System bidders
Sorted Details for Synthesis of Leaf Nodes with respect to GOAL
DISTRIBUTIVE MODE

LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
TECH =0.421				
.	HARDWARE =0.236			
.	.	PLC =0.093		
.	.	.	BIDDER#4 =0.048	
.	.	.	BIDDER#1 =0.015	
.	.	.	BIDDER#2 =0.015	
.	.	.	BIDDER#3 =0.015	
.	.	CWS =0.050		
.	.	.	BIDDER#2 =0.021	
.	.	.	BIDDER#4 =0.014	
.	.	.	BIDDER#1 =0.007	
.	.	.	BIDDER#3 =0.007	
.	.	INSTM =0.036		
.	.	.	BIDDER#1 =0.019	
.	.	.	BIDDER#4 =0.008	
.	.	.	BIDDER#2 =0.004	
.	.	.	BIDDER#3 =0.004	
.	.	EWS =0.033		
.	.	.	BIDDER#2 =0.014	
.	.	.	BIDDER#4 =0.010	
.	.	.	BIDDER#1 =0.005	
.	.	.	BIDDER#3 =0.005	
.	.	COM-ACC =0.015		
.	.	.	BIDDER#1 =0.004	
.	.	.	BIDDER#2 =0.004	
.	.	.	BIDDER#3 =0.004	
.	.	.	BIDDER#4 =0.003	
.	.	FUR/MISC =0.009		
.	.	.	BIDDER#1 =0.002	
.	.	.	BIDDER#2 =0.002	
.	.	.	BIDDER#3 =0.002	
.	.	.	BIDDER#4 =0.002	
.	SOFTWARE =0.185			
.	.	PLC PRG =0.087		
.	.	.	BIDDER#4 =0.033	
.	.	.	BIDDER#1 =0.018	
.	.	.	BIDDER#2 =0.018	
.	.	.	BIDDER#3 =0.018	
.	.	MMI =0.063		
.	.	.	BIDDER#2 =0.025	
.	.	.	BIDDER#4 =0.016	
.	.	.	BIDDER#1 =0.011	
.	.	.	BIDDER#3 =0.011	
.	.	EXPERT =0.035		
.	.	.	BIDDER#1 =0.011	
.	.	.	BIDDER#2 =0.009	
.	.	.	BIDDER#4 =0.008	
.	.	.	BIDDER#3 =0.008	
PRICE =0.217				
.	BIDDER#2 =0.087			
.	BIDDER#3 =0.062			
.	BIDDER#1 =0.049			

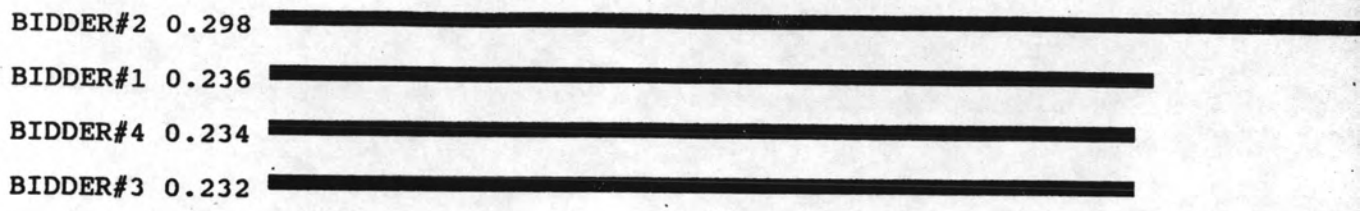
Selection of Control System bidders
Sorted Details for Synthesis of Leaf Nodes with respect to GOAL
DISTRIBUTIVE MODE

LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
.	BIDDER#4 =0.019			
PRJ MGT =0.134				
.	SCHEDULE =0.073			
.	.	BIDDER#1 =0.019		
.	.	BIDDER#2 =0.019		
.	.	BIDDER#3 =0.019		
.	.	BIDDER#4 =0.014		
.	SERVICE =0.021			
.	.	BIDDER#1 =0.005		
.	.	BIDDER#2 =0.005		
.	.	BIDDER#3 =0.005		
.	.	BIDDER#4 =0.005		
.	WARRANTY =0.019			
.	.	BIDDER#2 =0.007		
.	.	BIDDER#4 =0.004		
.	.	BIDDER#1 =0.004		
.	.	BIDDER#3 =0.004		
.	PAYMENT =0.012			
.	.	BIDDER#4 =0.006		
.	.	BIDDER#1 =0.002		
.	.	BIDDER#2 =0.002		
.	.	BIDDER#3 =0.002		
.	TRAINING =0.009			
.	.	BIDDER#1 =0.002		
.	.	BIDDER#2 =0.002		
.	.	BIDDER#3 =0.002		
.	.	BIDDER#4 =0.002		
CAPBTY =0.131				
.	BIDDER#1 =0.037			
.	BIDDER#2 =0.037			
.	BIDDER#3 =0.037			
.	BIDDER#4 =0.021			
DOCUMENT =0.097				
.	DGN INTR =0.053			
.	.	BIDDER#1 =0.014		
.	.	BIDDER#2 =0.014		
.	.	BIDDER#3 =0.014		
.	.	BIDDER#4 =0.010		
.	PROP DOC =0.044			
.	.	BIDDER#1 =0.012		
.	.	BIDDER#2 =0.012		
.	.	BIDDER#3 =0.012		
.	.	BIDDER#4 =0.009		

Selection of Control System bidders

Synthesis of Leaf Nodes with respect to GOAL
DISTRIBUTIVE MODE

OVERALL INCONSISTENCY INDEX = 0.00



BIDDER#1 --- BIDDER NO.1
BIDDER#2 --- BIDDER NO.2
BIDDER#3 --- BIDDER NO.3
BIDDER#4 --- BIDDER NO.4

ประวัติผู้เขียน

นายสุกิจ อังสุวรรณ เกิดเมื่อวันที่ 18 สิงหาคม 2508 ที่จังหวัดนครราชสีมา สำเร็จการศึกษาปริญญาตรีวิศวกรรมศาสตร์บัณฑิต จากมหาวิทยาลัยขอนแก่น เมื่อปี พ.ศ.2530 และเข้าศึกษาต่อในหลักสูตรวิศวกรรมศาสตรมหาบัณฑิต ที่จุฬาลงกรณ์มหาวิทยาลัย เมื่อ พ.ศ.2535