IE 300 SUMMER TRAINING II – QUESTIONS AND TASKS

1. Full title, address, foundation date, employment data (number of workers, technical and administrative staff, etc.), main products, competitors about the company should be provided in tabular format.

2. Discuss the organizational structure of the company referring to the organizational chart (if it is not available, prepare it yourself). How many industrial engineers are employed in the company? For one industrial engineer, provide name, title, duties and his/her responsibilities. Describe how the management functions (such as Planning, Organizing, Staffing, Directing, and Controlling) are performed in the company.

3. Explain briefly the types of manufacturing processes that exist in the plant. If the company is in the service sector, explain briefly the types of service processes that exist in the company.

4. Which factors were taken into account when it was decided to locate the plant at the present location? Explain each of them and discuss their appropriateness. Is the company planning to add new facilities to the existing one(s)? Which factors do they consider?

5. What are the types of layout observed in the plant? Discuss the advantages and disadvantages of these layout types. Draw the company layout (block plan). Explain the flows and relationships between the departments by preparing a representative from-to chart and a relation-ship chart. Draw a detailed layout of a selected department.

6. How does the company define quality? Is there any quality assurance standard applied in the company? Who is responsible from quality management and/or relevant issues? What are the basic responsibilities?

7. Describe the information flow between existing departments of the company. What is the information flow media (for example, do they use computers for this purpose) through the departments? Add some examples of the forms used for information flow and explain their functions? What types of computer programs and software packages are being used? Make a classification of available computer hardware, according to departments?

8. What type(s) of production environments (MTO: make-to-order, MTS: make-to-stock, ATO: assemble-to-order) is(are) observed in the company? Briefly explain. If the company is operating in the service sector, explain the flow of goods, services,

information and money including the customers, suppliers, state, etc. Briefly explain and illustrate with a simple diagram.

9. Explain the forecasting activities used in the company. For what sort of items forecasting is essential. Are the planning engineers satisfied with forecasting accuracy? Explain with some examples.

10. Explain the Material Requirements Planning (MRP) activities in the company. If MRP is not applied, then explain how requirements for raw materials, sub-assembly items, components, etc. are calculated.

11. How is scheduling of activities being done. Explain the time frame for scheduling (weekly, monthly, etc.). If the company is operating in the service sector, then explain how jobs, tasks are assigned to workers.

12. What types of inventories are used in the company? Why is the company holding these inventories (give reasons for each type)? If the company does not store any significant amount of inventory, explain why that is not so.

IE 300 SUMMER TRAINING II – ADDITIONAL TASKS (AT LEAST TWO)

- Obtain past sales data of a product/service in your company and plot the data on a graph. Determine the patterns that you observe from the graph (trend, seasonality, cycles, irregular/random variations, etc.) that fits the data. Write the most suitable forecasting model for your data. Use the model and forecast for at least 5 periods ahead. Check for errors (MSE) to compare forecasts with actual sales.

- Capacity planning is the process of determining the production capacity needed by an organization to meet changing demands for its products, and of reconciling the difference and between the capacity available and the capacity required. How does the company define and measure their capacity? How the utilization and efficiency are determined? Does the company make Rough-cut and/or Detailed Capacity Plans? If yes, explain how. If no, propose methods for making capacity plans.

- Determine the classification (discrete/continuous, objective, distance metric …) of the location problem. Identify the critical, subjective, and objective factors related. Evaluate the current location with respect to these factors. Generate at least three alternative site locations for the company. Select and apply a technique in order to propose a location. Discuss its appropriateness.

- Discuss the types of performance measures (scheduling criteria) used in scheduling. Consider the operations performed on a machine/service station. Determine how they sequence jobs on this machine. Explain and provide a related Gantt chart. Which priority rules (FCFS, LCFS, SPT, DD, etc.) are used? If any dispatching rule is not used, suggest an appropriate priority rule and implement it on a set of jobs to be scheduled on the machine/service station. Show the schedule on a Gantt chart.

- Determine the classification (discrete/continuous, objective, distance metric, construction/improvement, …) of the layout problem. Identify the space requirements of the departments. Develop the relation-ship chart and the flows between the departments. Select and apply a technique to obtain a proposed block plan. Justify the proposed block plan.

- Apply ABC analysis for at least 15 inventory items of the company, and give details. Estimate the parameters (holding cost, ordering or set-up cost, etc.) of EOQ models applicable to one inventory item in each class (A, B, and C). Determine the EOQ and corresponding cost for each of the three items chosen.

- Develop a product-structure tree, an assembly-time chart, and a master schedule. Also give the material requirements plan for one component, which is being produced by the company.

- Determine a process which results with defective products or choose a product/service which has caused customer complaints. Identify the possible causes and draw a cause-effect diagram. Prepare a simple questionnaire for the employees of the company in which you ask them their opinion as to the root causes of the problematic process or service. Based on the questionnaire results, conduct a Pareto analysis to determine the most important root causes.

IE 300 SUMMER TRAINING II – INDUSTRIAL ENGINEERING PROBLEM

1. PROBLEM IDENTIFICATION AND DEFINITION

This first step is critical. It is essential for the student to have a clear understanding of the problem as a whole. A good way to define the problem is to write down a concise statement which summarizes the problem and its environment, the current status and finally write down the goals, where you want to be after the problem has been resolved.

It is essential to develop an objective statement which clearly describes the current condition you and your company wishes to change. Make sure the problem is limited in the scope so that it is small enough to realistically tackle and solve. Writing the statement will ensure that everyone can understand exactly what the problem is. It is important to avoid including any "implied cause" or "implied solution" in the problem statement. Remember, a problem well stated is a problem half solved.

2. DATA GATHERING AND ANALYSIS

In this stage of problem solving, questions should be asked and in return data and information are gathered. The objective is to get as much information about the problem as possible. This involves determining what information is critical and how best to obtain it. It often requires making trade-offs between the types of information and the level of detail and making judgments about the value of the information relative to the level of effort and cost required to obtain it. Do not make the mistake of assuming you know what is causing the problem without an effort to fully investigate the problem environment you have defined. Try to view the problem from a variety of viewpoints, be an open minded. Investigate how the issue under consideration affects others. It is essential to spend enough time researching the problem.

Among the possible questions to be asked when analyzing the problem are listed below.
- What is the history of the problem? How long has it existed?
- How serious is the problem?
- What are the causes of the problem?
- What are the effects of the problem?
- What are the symptoms of the problem?
- What methods does the company already have for dealing with the problem?
- What are the limitations of those methods?
- Can the problem be divided into sub problems?

3. MODEL FORMULATION

In this step, the problem should be represented by a model. An analytical model (mathematical programming-LP, IP, MIP, DP, NLP, differential equations, stochastic processes, decision trees, statistics, queuing models, etc.) is preferred. However, because of complexity, stochastic relations, so on, some problems cannot be represented properly by an analytical model. In such instances, simulation models are the best alternatives.

4. DEVELOPING ALTERNATIVE SOLUTIONS, EVALUATION OF ALTERNATIVE SOLUTIONS AND PROPOSED SOLUTION(S)

This step requires a mix of using analytical tools and software by using your own creativity. Applying one of the tools directly is a naive way of solving problems. It is usually required to apply the mixed combination of tools with which you are equipped in IE courses to generate and compare the solution alternatives.

Developing a set of evaluation criteria and performance metrics are required for comparing the alternative solutions. Realizing this is not an easy step including trade-offs and sacrifices, these criteria are usually needed to be prioritized, either implicitly or explicitly, depending on different (operator, manager, executive, environment, society, etc.) perspectives.

5. SENSITIVITY/PARAMETRIC ANALYSES

Real life is full of uncertainties. Hence, you must treat uncertainty in the problem solving process through either by post optimality analysis or stochastic treatment of the situation. For example, information will either be unknown or uncertain, or future requirements may significantly change over time. It is vital to understand the impact of these on the problem environment so as to obtain a robust solution over a range of potential scenarios. Thus, it is handy to perform sensitivity/parametric analyses rather than intractable probabilistic/ stochastic treatments.

Your task in this stage is to vary the value of one parameter while keeping the others fixed to see what happens to the solution that you suggest.