National Examinations May 2014
98-Ind-A3- Facilities Planning
3 hours duration

Notes:

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made.

2. This is a Closed Book exam. Candidates may use one of two calculators, the Casio or Sharp approved models.

3. Any five questions constitute a complete paper. Only the first five questions as they appear in your answer book will be marked.

4. All questions are of equal value.

5. Write your answers in point-form whenever possible, but fully.
   Show all calculations.

Marking Scheme (marks)

1.	(i) 6,	(ii) 7,	(iii) 7
2.	(i) 6,	(ii) 7,	(iii) 7
3.	(i) 5,	(ii) 5,	(iii)10
4.	(i) 8,	(ii) 7,	(iii) 5
5.	(i) 7,	(ii) 6,	(iii) 7
6.	(i) 6,	(ii) 6,	(iii) 8
7.	(i) 5,	(ii) 5,	(iii) 10

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1. (i) What factors are considered in developing facilities design alternatives?
(ii) Explain your understanding of: (a) material flow planning hierarchy, (b) work simplification approach to material flow, and (c) principle of minimizing the cost of material flow.
(iii) What are the resources of physical distribution systems for finished goods produced by a firm?

2. (i) State the characteristics of a manufacturing cell.
(ii)What are the advantages and disadvantages of cell layout?
(iii) State the manner by which the benefits of cellular manufacturing can be enhanced through Just-in-Time (JIT), Total Quality Management (TQM) and Total Employee Involvement (TEI).

3. ((i) State the steps that are followed to determine the total machine space requirements in the design of an entire manufacturing facility.
(ii) How would you determine the amount of space per machine?
(iii) The assembly task elements and their assembly precedence requirements are known. An output of approximately 65 units per hour is required and the plan is to produce them all on one assembly line. Show a schematic of the number of stations. What is the actual possible efficiency? Use *Ranked Positional Weight Technique* in solving the assembly line problem.

Task element	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Element time(min)	0.2	0.4	0.7	0.3	0.8	0.6	0.2	0.2	0.8	0.3	0.5	0.1	0.3	0.6
Preceding elements	-	1	1	2	3	3	4	4	5	6	6	7,8	10,11	9,12,13

4. (i) (a) The average operator of a certain company performs at 100% (average pace) and the range of performance is from about 60% to 140%, and the distribution is assumed to be normal. Determine the station speed of the company's assembly line assuming that it is set for the operator whose pace is 85% of average (Z value for 85% or 15% = 1.04 or, -1.04).
(b) Suppose the assembly line is decoupled and the line could be set for an average operator, what would be the gain in station speed?
(ii) Explain the characteristics of the following two programs in the context of computerized layout of multiple items: (a) CRAFT and (b) CORELAP.
(iii) State the basic requirements of computerized layout programs for multiple items.

5. (i) Define the concept of materials handling in the context of facilities planning. State the objectives of materials handling
(ii) Explain the concept of the materials handling equation.
(iii) What steps are followed in designing a materials handling system?

6. (i) State the steps that are followed in designing a material handling system.
(ii) What are the desirable attributes of shipping and receiving facilities plans?
(iii) State the characteristics of: (a) powered roller conveyors, (b) bridge cranes, and (c) industrial robots.

7. (i) What are the advantages of centralizing tool and gauge cribs in a production plant?
(ii) State under what circumstances it would be desirable to decentralize tool and gauge cribs.
(iii) As an industrial engineer you are asked to conduct a feasibility study to justify the consolidation of tool and gauge cribs and providing a dispatching system in a manufacturing plant so that tools and gauges can be delivered directly to the production operators and manufacturing inspectors.
(a) Explain clearly the specific advantages of such a system.
(b) How would you conduct the study with particular reference to the collection of the relevant data and information to justify the project?