National Exams December 2008
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.

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Marking Scheme (marks)

1.	(i) 6,	(ii) 7,	(iii) 7
2.	(i) 6,	(ii) 7,	(iii) 7
3.	(i) 6,	(ii) 8,	(iii) 6
4.	(i) 8,	(ii) 7,	(iii) 5
5.	(i) 10,	(ii) 5,	(iii) 5
6.	(i) 8,	(ii) 6,	(iii) 6
7.	(i) 8,	(ii) 12	

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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 your understanding of computer-integrated manufacturing systems (CIMS).
(ii) Describe the Muther's Systematic Layout Planning (SLP) procedure by means of a diagram. State the steps followed in the SLP procedure.
(iii) Explain the concept of activity relationships in the context of the facility planning process

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) 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* (preferably) or trial and error method 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

(ii) What is the purpose of buffer design in flow lines? State the two buffering techniques that use decoupling for the purpose.
(iii) State the two major costs involved in providing a buffer.

6. (i) The market estimate of a product is 20,000 pieces and requires three processing steps: (1) milling, (2) boring, and (3) grinding. The scrap rate at the three processing operations are: (1) 6%, (2) 5%, and (3) 4% and the rework rates are (1) 4%, (2) 3%, and (3) 2%. For each operation calculate the following: (a) production quantity scheduled (pieces), and (b) expected number of good pieces produced.
(ii) What are some of the desirable attributes of receiving and shipping facilities plans?
(iii) Discuss the impact of automated storage and retrieval system (AS/RS) on manufacturing and warehousing.

7. (i) State the characteristics of the following: (a) powered roller conveyer, (b) bridge cranes, and (c) industrial robot.
(ii) 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 (economically) the project?