

**National Exams May 2010**  
**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.

Front Page

**Marking Scheme (marks)**

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

**National Exams May 2010**  
**98-Ind-A3 - Facilities Planning**

1. (i) Explain the concept of facilities planning hierarchy by means of a suitable diagram.  
(ii) What are the steps followed for the facilities planning process in a manufacturing facility?  
(iii) State the variety of circumstances that require the need of a plant facility layout study.
2. (i) What are the advantages and disadvantage of non-progressive assembly or progress layout compared to progressive assembly or line layout?  
(ii) State your understanding of computer-integrated manufacturing systems (CIMS).  
(iii) Discuss the dramatic impact of an automated storage and retrieval system (AS/RS) on manufacturing and warehousing.
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 manufacturing product has a market estimate of 15,000 components and requires four processing steps: (a) turning, (b) milling, (c) drilling, and (d) grinding. The scrap rate of the four processing operations are: (a) 6%, (b) 5%, (c) 4%, and (d) 3% and the rework rates are: (a) 4%, (b) 3%, (c) 3% and (d) 1%. For each operation, calculate the following: (a) production quantity (pieces) scheduled, and (b) expected number of good pieces produced.  
(ii) State the basic requirements of computerized layout programs for multiple items.  
(iii) What are the basic problems associated with computerized layout program that limit its use in industry?
5. (i) What is the purpose of buffer design in flow lines? State the two buffering techniques that use decoupling for the purpose.  
(ii) State the two major costs involved in providing a buffer.  
(iii) Describe the Muther's Systematic Layout Planning (SLP) procedure by means of a diagram. State the steps followed in the SLP procedure.

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?