National Examinations December 2015
98-Ind-A3- Facilities Design
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) 10,	(ii) 5,	(iii) 5
4.	(i) 8,	(ii) 6,	(iii) 6
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) Briefly explain the concept of facilities planning hierarchy by means of a suitable diagram.
(ii) State the steps that are followed for the facilities planning process in a manufacturing facility.
(iii) What are the pitfalls in the selection of a manufacturing plant site?

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) A company works 8 hour days for 5 days per week. The production line of the company is operated 7 hours per day. Given the information in the table below, determine the theoretical minimum number of stations the line should be designed for an output of 130 units per week. Show a schematic of the number of stations. What is the actual possible efficiency? Use the *Ranked Positional Weight Technique* in solving the assembly line problem.

Task element	1	2	3	4	5	6	7	8	9	10	11	12
Element time(min)	12	6	6	2	2	12	7	5	1	4	6	7
Preceding elements	-	1	2	2	2	2	3,4	7	5	9,6	8,10	11

(ii) In progressive assembly, state the reasons for the increase in the line balancing delay.
(iii) State the manner by which modifications to standard technique can be made to balance assembly/flow lines.

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) 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?