

National Examinations May 2018
17-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)

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

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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) 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) 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) 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) Define the concept of materials handling in the context of facilities planning. State the objectives of materials handling.
 - (ii) Explain the concept of the material handling equation.
 - (iii) You have been entrusted to improve the facilities design (plant layout and materials handling) of a manufacturing plant.
 - (a) State the areas of the manufacturing plant that have the greatest opportunity for improvement. Explain briefly.
 - (b) Explain the systematic procedure you would follow to accomplish your objective.
 - (c) State the nature of the data or information you would require to solve the problem and the specific techniques you would employ.