

National Examinations December 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) 7, | (ii) 6, | (iii) 7 |
| 3. | (i) 10, | (ii) 5, | (iii) 5 |
| 4. | (i) 8, | (ii) 6, | (iii) 6 |
| 5. | (i) 6, | (ii) 8, | (iii) 6 |
| 6. | (i) 6, | (ii) 5, | (iii) 9 |
| 7. | (i) 6, | (ii) 6, | (iii) 8 |

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1. (i) What are the objectives of facilities planning?
(ii) State the important questions that must be resolved in developing a material handling plan that will support manufacturing and distribution.
(iii) State the issues that may have a long range impact on the strategic facilities plan.
2. (i) 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.
(ii) Explain the concept of activity relationship and space requirements used as a foundation for the facility plan.
(iii) What are the advantages and disadvantages of product (line production) layout?
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) Explain the concept of manufacturing cell.
 - (ii) What are the benefits of integrating manufacturing cell with Just-in-Time (JIT), Total Quality Management (TQM) and Total Employee Involvement (TEI) concepts?
 - (iii) What is your understanding of: (a) logistics system and (b) flow patterns?

6.
 - (a) What is a unit load? State the advantages and disadvantages of a unit load.
 - (b) State the methods used for compensating height differences between truck and dock.
 - (c) State the characteristics of the following: (i) powered roller conveyors, (ii) bridge cranes, and (iii) industrial robot.

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.