

**National Examinations December 2012**  
**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) 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) 7, | (iii) 7 |
| 7. | (i) 8,  | (ii) 12 |         |

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**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) 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) Explain the characteristics of traditional manufacturing (TM) and contemporary manufacturing (CM).  
(ii) Briefly state the primary elements of just-in-time (JIT) production system.  
(iii) What are the most common sources of waste in industry?
7. (i) What are the characteristic features of the following: (a) belt conveyor, (b) bridge cranes, and (c) industrial robot.  
(ii) You have been charged with the responsibility of implementing a facilities design project for bagging ammonium nitrate fertilizers (granular substance) in 10, 20 and 30 kg, plastic and paper bags and shipping through railway box cars. The facility includes screw conveyor system for transporting fertilizers from the production plant to the bagging workstation, automatic weighing scale, turret hopper with spouts for bagging, heat sealer (for plastic bags)/sewing machine (for paper bags), steel wheel conveyor system for moving bags to railway box car and palletizer for stacking bags in the railway box car.
  - (a) Explain the problems that you envisage with particular reference to heat sealer, sewing machine, steel wheel conveyor and palletizer.
  - (b) State the factors that must be considered in the selection and installation of the various material handling equipment.
  - (c) How would you proceed to design such a facility including manpower requirements and work method?