

**THE NATIONAL COUNCIL OF EXAMINERS FOR ENGINEERING AND SURVEYING
PRINCIPLES AND PRACTICE OF ENGINEERING EXAMINATION**

**INDUSTRIAL
EFFECTIVE October 2005**

	Approximate Percentage of Examination
I. Facilities Engineering and Planning	20%
A. Facility Requirements	10%
1. Capacity analysis (e.g., space, people, equipment)	
2. Activity analysis (e.g., REL charts, FROM-TO charts)	
3. Process flow analysis (e.g., flow lines, job shops, cellular manufacturing)	
B. Facility Design Alternatives	10%
1. Site selection factors and methods (e.g., least cost assignment methods, center of gravity rule)	
2. Layout techniques (e.g., systematic layout planning, computer-aided techniques)	
3. Material handling techniques and equipment (e.g., unit load design, conveyors, AGVs)	
II. Systems Analysis and Design	20%
A. Analysis and Design Processes	12%
1. System analysis and design tools (e.g., input/output analysis, affinity diagrams, Pareto charts)	
2. Value analysis and engineering (e.g., projected cost flow, projected value stream analysis)	
3. Types of manufacturing processes (e.g., discrete versus continuous, turning, injection molding)	
B. Costing and Performance Measurement	8%
1. Cost accounting (e.g., product and process costing, standard costs, activity-based costing)	
2. Performance measures and applications (e.g., leading and lagging measures, metrics)	
III. Logistics	20%
A. Production Planning and Control	15%
1. Forecasting methods (e.g., exponential smoothing, seasonal methods)	
2. Aggregate planning	
3. Traditional strategies (e.g., MRP, MRP II, JIT)	
4. Lean manufacturing	
5. Scheduling	
6. Inventory control	
B. Distribution and Storage/Warehousing Methods	5%
1. Direct shipment, warehousing, cross-docking	
2. Transshipment	
3. Routing	

	Approximate Percentage of Examination
IV. Work Design	12%
A. Methods to Measure Work	6%
1. Motion study	
2. Operations process charts	
3. Predetermined time systems	
4. Work sampling	
B. Methods Design and Analysis	6%
1. Workstation design	
2. Worker capacity analysis (e.g., lefthand-righthand, multiple activity, work distribution charts)	
V. Ergonomics and Safety	13%
A. Risk Factors and Exposure Limits	8%
1. Back injuries (e.g., NIOSH lifting equation)	
2. Cumulative trauma disorders of the upper extremities (e.g., force, frequency, awkward postures, vibration, cold temperatures, Rapid Upper Limb Assessment)	
3. Noise (e.g., calculation of OSHA noise PELs)	
B. Design Issues	5%
1. Job design issues (e.g., worker satisfaction)	
2. Workplace design/human machine interface design (e.g., use of anthropometric data)	
VI. Quality Engineering	15%
A. Quality Control	10%
1. Control charts (e.g., X-bar and R charts, p and np charts)	
2. Acceptance sampling (e.g., single and double sampling, MILSTD 105E)	
3. Process capability analysis (e.g., C_p , C_{pk})	
4. Design for quality (e.g., design of experiments, Taguchi methods)	
5. Qualitative approaches (e.g., Total Quality Management, Kaizen, ISO)	
B. Reliability and Maintainability	5%
1. Component and system reliability (e.g. fault-tree analysis, failure modes, redundancy)	
2. Maintenance strategies (e.g., predictive, preventive)	
TOTAL	100%

NOTES

1. The examination is developed with questions that will require a variety of approaches and methodologies including design, analysis, application, and operations. Some questions may require knowledge of engineering economics, probability and statistics, operations research techniques, engineering management systems, project management, and codes and standards (e.g., ISO, OSHA, MILSTD, and NIOSH).
2. The knowledge areas specified under A and B are examples of kinds of knowledge, but they are not exclusive or exhaustive categories.
3. This examination contains a total of 80 multiple-choice questions. Examinee works all questions.