

Indian Statistical Institute, Bangalore
Statistical Quality Control & Operations Research Unit
MS (QMBA) First Year [Batch 2026-2027]
Subject: **Foundation of Industrial Engineering**

Exam: **Midterm**
Maximum Marks: **30**

Date: **07th September 2026**
Duration: **2.0 hours**

Figure in the right-hand margin indicates full marks for the questions.

- 1 a) Bharat Precision Electronics Ltd. manufactures two products—Communication Modules and Power Supply Units. The company wants to evaluate its overall productivity for August using the Craig and Harris Productivity Model. The relevant production and financial data are given below. During final inspection, 2% of the total production was rejected, and the rejected units had no resale value. The monthly capital input cost is estimated at 1.25% of the capital employed. [5]

Product/Input	Communication Modules	Power Supply Units
Production quantity (units)	460	580
Standard selling price (₹/unit)	18,000	12,000
Labour cost (₹)	16,20,000	19,00,000
Material cost (₹)	52,50,000	45,00,000
Energy cost (₹)	4,80,000	4,00,000
Maintenance and other costs (₹)	5,60,000	6,50,000
Capital employed (₹)	1,20,00,000	1,30,00,000

Using the Craig and Harris Productivity Model, calculate the total value of acceptable output, total input cost, and overall productivity index. Interpret the result.

- b) A technician manually assembles an electronic control module at BEL. The assembly process consists of four work elements. An industrial engineer conducts a stopwatch time study and records the average observed time and performance rating shown below. [5]

Work element	Average observed time (minutes)	Performance rating
Collect components and PCB	0.10	90%
Mount components on PCB	0.28	110%
Tighten and inspect connections	0.16	100%
Label and place unit in tray	0.06	95%

The company provides an allowance of 15% of normal time for personal needs, fatigue and unavoidable delays. Calculate the normal time for each work element, total normal cycle time, standard cycle time, and the expected number of modules produced during an 8-hour shift. Assume that the available production time is 450 minutes per shift.

- 2 **Answer the following (Any two)**
- a) Define Industrial Engineering and explain its major activities. [5]
- b) List the major techniques used in Industrial Engineering. Explain any one technique with a suitable example. [5]
- c) Define work study and explain its major components. How does work study help improve organizational productivity? [5]
- d) Define production & productivity and explain the factors of production with a suitable example. [5]
- 3 **Write short notes with a suitable example (Any two)** [5x2=10]
- a) American Productivity Centre (APC) Model.
- b) Engineering Specifications.
- c) Automated work system.