B.E. FOOD TECHNOLOGY AND BIO-CHEMICAL ENGINEERING FOURTH YEAR SECOND SEMESTER EXAM 2025

SUBJECT: INDUSTRIAL MANAGEMENT

Time: 3 Hours **Full Marks: 100**

Assume any relevant data, if necessary. Symbols in the Question Paper carry their usual meanings. Figures in the margin indicate full marks. All Parts of any one question must be answered together. Answer strictly to the point.

ANSWER ANY FOUR QUESTIONS

Q1. a) Boreki Enterprises has the following 10 items in inventory. Theodore Boreki asks to divide these items into ABC classification.

Item	Stock Number	Annual Volume (Units)	Unit Cost ($)
1	A2	3000	50
2	B8	4000	12
3	C7	1500	45
4	D1	6000	10
5	E9	1000	20
6	F3	500	500
7	G2	300	1500
8	H2	600	20
9	I5	1750	10
10	J8	2500	5

b) Surge Electric uses 4,000 toggle switches a year. Switches are priced as follows: 1 to 499, 90 cents each; 500-999, 85 cents each; and 1,000 or more, 80 cents each. It costs approximately $30 to prepare an order and receive it, and carrying costs are 40% of the purchase price per unit on an annual basis. Determine the optimal order quantity and the total annual cost.

12+13 = 25

Q2. a) Rich Cole Control Devices, Inc., produces custom-built relay devices for auto makers. The most recent project undertaken by Cole requires 14 different activities. Cole's managers would like to determine the total project completion time (in days) and those activities that lie along the critical path. The appropriate data are shown in the following table.

i) What is the probability of being done in 53 days (use Appendix I)?

ii) What date results in a 99% probability of completion (use Appendix I)?

Activity	Immediate Predecessor	Time estimates (in days)		
		Optimistic	Most	Pessimistic
A	—	4	6	7
B	—	1	2	3
C	A	6	6	6
D	A	5	8	11
E	B, C	1	9	18
F	D	2	3	6
G	D	1	7	8
H	E, F	4	4	6
I	G, H	1	6	8
J	I	2	5	7
K	I	8	9	11
L	J	2	4	6
M	K	1	2	3
N	L, M	6	8	10

b) Write a short note on: Crashing

20+5 = 25

Q3. a) Sales of hair dryers at the Walgreens stores in Youngstown, Ohio, over the past 4 months have been 100, 110, 120, and 130 units (with 130 being the most recent sales). Develop a moving-average forecast for next month, using these three techniques:

i) 3-month moving average.
ii) 4-month moving average.
iii) Weighted 4-month moving average with the most recent month weighted 4, the preceding month 3, then 2, and the oldest month weighted 1.
iv) If next month's sales turn out to be 140 units, forecast the following month's sales (months) using a 4-month moving average.

b) George Kyparisis owns a company that manufactures sailboats. Actual demand for George's sailboats during each of the past four seasons was as follows:

	Year			
Season	1	2	3	4
Winter	1400	1200	1000	900
Spring	1500	1400	1600	1500
Summer	1000	2100	2000	1900
Autumn	600	750	650	500

George has forecasted that annual demand for his sailboats in year 5 will equal 5,600 sailboats. Based on this data and the multiplicative seasonal model, what will the demand level be for George's sailboats in the spring of year 5?

c) What is coefficient of correlation?

7+15+3 = 25

Q4. a) A company makes two kinds of leather belts, belt A and belt B. Belt A is a high quality belt and belt *B* is of lower quality. The respective profits are Rs. 4 and Rs. 3 per belt. The production of each of type *A* requires twice as much time as a belt of type B, and if all belts were of type B, the company could make 1,000 belts per day. The supply of leather is sufficient for only 800 belts per day (both A and B combined). Belt A requires a fancy buckle and only 400 of these are available per day. There are only 700 buckles a day available for belt B.

i) What should be the daily production of each type of belt? Formulate this problem as an LP model and solve it using the simplex method.

b) Cohen Chemicals, Inc., produces two types of photo-developing fluids. The first, a black-and-white picture chemical, costs Cohen $2,500 per ton to produce. The second, a color photo chemical, costs $3,000 per ton. Based on an analysis of current inventory levels and outstanding orders, Cohen's production manager has specified that at least 30 tons of the black-and-white chemical and at least 20 tons of the color chemical must be produced during the next month. In addition, the manager notes that an existing inventory of a highly perishable raw material needed in both chemicals must be used within 30 days. To avoid wasting the expensive raw material, Cohen must produce a total of at least 60 tons of the photo chemicals in the next month. Solve this minimization problem using graphical method.

18+7 = 25

Q5. a) What are the duties of the manager as suggested by F. W. Taylor?

b) State about "responsibility", "authority" and "unity of command".

c) State the various factor affecting plant location.

d) Explain travel chart and load path matrix

5+6+6+8 = 25

Q6. a) Marty McDonald has a business packaging software in Wisconsin. His annual fixed cost is $10,000, direct labor is $3.50 per package, and material is $4.50 per package. The selling price will be $12.50 per package. **i)** What is the break-even point in dollars? **ii)** What is break-even in units?

b) Which 3 of Deming's 14 points do you think are most critical to the success of a TQM program? Why?

c) Explain how improving quality can lead to reduced costs.

d) Write short note on: Fish-Bone Chart (or Cause-and-Effect Diagram).

8+6+5+6 = 25

APPENDIX I

Normal Curve Areas

Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.50000	.50399	.50798	.51197	.51595	.51994	.52392	.52790	.53188	.53586
.1	.53983	.54380	.54776	.55172	.55567	.55962	.56356	.56749	.57142	.57535
.2	.57926	.58317	.58706	.59095	.59483	.59871	.60257	.60642	.61026	.61409
.3	.61791	.62172	.62552	.62930	.63307	.63683	.64058	.64431	.64803	.65173
.4	.65542	.65910	.66276	.66640	.67003	.67364	.67724	.68082	.68439	.68793
.5	.69146	.69497	.69847	.70194	.70540	.70884	.71226	.71566	.71904	.72240
.6	.72575	.72907	.73237	.73565	.73891	.74215	.74537	.74857	.75175	.75490
.7	.75804	.76115	.76424	.76730	.77035	.77337	.77637	.77935	.78230	.78524
.8	.78814	.79103	.79389	.79673	.79955	.80234	.80511	.80785	.81057	.81327
.9	.81594	.81859	.82121	.82381	.82639	.82894	.83147	.83398	.83646	.83891
1.0	.84134	.84375	.84614	.84849	.85083	.85314	.85543	.85769	.85993	.86214
1.1	.86433	.86650	.86864	.87076	.87286	.87493	.87698	.87900	.88100	.88298
1.2	.88493	.88686	.88877	.89065	.89251	.89435	.89617	.89796	.89973	.90147
1.3	.90320	.90490	.90658	.90824	.90988	.91149	.91309	.91466	.91621	.91774
1.4	.91924	.92073	.92220	.92364	.92507	.92647	.92785	.92922	.93056	.93189
1.5	.93319	.93448	.93574	.93699	.93822	.93943	.94062	.94179	.94295	.94408
1.6	.94520	.94630	.94738	.94845	.94950	.95053	.95154	.95254	.95352	.95449
1.7	.95543	.95637	.95728	.95818	.95907	.95994	.96080	.96164	.96246	.96327
1.8	.96407	.96485	.96562	.96638	.96712	.96784	.96856	.96926	.96995	.97062
1.9	.97128	.97193	.97257	.97320	.97381	.97441	.97500	.97558	.97615	.97670
2.0	.97725	.97784	.97831	.97882	.97932	.97982	.98030	.98077	.98124	.98169
2.1	.98214	.98257	.98300	.98341	.98382	.98422	.98461	.98500	.98537	.98574
2.2	.98610	.98645	.98679	.98713	.98745	.98778	.98809	.98840	.98870	.98899
2.3	.98928	.98956	.98983	.99010	.99036	.99061	.99086	.99111	.99134	.99158
2.4	.99180	.99202	.99224	.99245	.99266	.99286	.99305	.99324	.99343	.99361
2.5	.99379	.99396	.99413	.99430	.99446	.99461	.99477	.99492	.99506	.99520
2.6	.99534	.99547	.99560	.99573	.99585	.99598	.99609	.99621	.99632	.99643
2.7	.99653	.99664	.99674	.99683	.99693	.99702	.99711	.99720	.99728	.99736
2.8	.99744	.99752	.99760	.99767	.99774	.99781	.99788	.99795	.99801	.99807
2.9	.99813	.99819	.99825	.99831	.99836	.99841	.99846	.99851	.99856	.99861
3.0	.99865	.99869	.99874	.99878	.99882	.99886	.99889	.99893	.99896	.99900
3.1	.99903	.99906	.99910	.99913	.99916	.99918	.99921	.99924	.99926	.99929
3.2	.99931	.99934	.99936	.99938	.99940	.99942	.99944	.99946	.99948	.99950
3.3	.99952	.99953	.99955	.99957	.99958	.99960	.99961	.99962	.99964	.99965
3.4	.99966	.99968	.99969	.99970	.99971	.99972	.99973	.99974	.99975	.99976
3.5	.99977	.99978	.99978	.99979	.99980	.99981	.99981	.99982	.99983	.99983
3.6	.99984	.99985	.99985	.99986	.99986	.99987	.99987	.99988	.99988	.99989
3.7	.99989	.99990	.99990	.99990	.99991	.99991	.99992	.99992	.99992	.99992
3.8	.99993	.99993	.99993	.99994	.99994	.99994	.99994	.99995	.99995	.99995
3.9	.99995	.99995	.99996	.99996	.99996	.99996	.99996	.99996	.99997	.99997