B.E. MECHANICAL ENGINEERING
THIRD YEAR; SECOND SEMESTER; SUPPLEMENTARY EXAM 2023

INDUSTRIAL MANAGEMENT

Time: Three hours   **Full Marks: 100**

Answer *any five (05)* questions.
Assume suitable data, if needed.
Use graph papers for graphical problems.

1. (a) Discuss about 'Training-Selection-Motivation' as suggested by F. W. Taylor.
   (b) How many different formal relationships are possible in a company with span of control of 5? Discuss in details.   [6+14=20]

2. (a) Define the term 'Quality'. With proper examples discuss about quality control by (i) attributes and (ii) variables.
   (b) Mention at least three fixed cost and variable cost items in break-even analysis. Why they are called fixed?
   (c) Draw a 'Flow Process Chart' containing at least 15 statements about a real life industrial operation.   [(6+4)+10=20]

3. (a) Discuss about eight (08) major principles of TQM.
   (b) Write explanatory note on 'Agile Manufacturing'.
   (c) Write explanatory note on OC curve.   [10+6+4=20]

4. The location of a tractor factory in a South Delhi site will result in certain annual fixed costs, variable costs and revenue. The figures would be different for a South Bombay site. The fixed costs, variable costs and price per unit for both the sites are given below.

Location Site	Fixed Costs (Rs.)	Variable Costs (Rs.)	Price per Unit (Rs.)
South Delhi	40,00,000	30,000	75,898
South Mumbai	60,00,000	24,000	82,000

   (a) Find out the breakeven volumes in both the locations.
   (b) What would be the expected revenues at both the locations for an estimated sales volume of 95 units?
   (c) What may be the overall locational decision and why?

Draw necessary graphs (using graph paper).   [20]

[Turn over

5. (a) Consider the following LP formulation.

Maximize $Z = 30x_1 + 10x_2$

Subject to: $3x_1 + x_2 \leq 300$; $x_1 + x_2 \leq 200$; $x_1 \leq 100$; $x_2 \geq 50$; $x_1 - x_2 \leq 0$ and $x_1, x_2 \geq 0$

(i) Graphically, illustrate the feasible solution region and apply the extreme point solution method to indicate which corner point produces the optimal solution. (ii) What is optimal solution? (iii) Is there more than one optimal solution? Explain.   [20]

6. (a) Given below is a group of jobs. Develop a network based on AOA for these jobs, minimizing as far as possible the number of dummy activities. Also, determine the critical path and project duration.

Job	A	B	C	D	E	F	G	H	I	J	K	L
Immediate predecessor(s)	----	-----	A	A	B	C,E	B	C,D	G	G	H,F	I,J
Time (days)	5	4	3	2	2	4	3	6	5	2	2	3

(b) Discuss the significance of the critical path in project management.
(c) Compare between PERT and CPM in project management.   [12 + 4 +4]

7. (a) Ten samples of 15 parts each were taken from an ongoing process to establish a control chart. The details are shown below. Develop a control chart from 95 percent (1.96 sd) confidence. Based on the plotted data, what comments can you make?

Sample	n	No. of defects in sample	Sample	n	No. of defects in sample
1	15	3	6	15	2
2	15	1	7	15	0
3	15	0	8	15	3
4	15	2	9	15	4
5	15	1	10	15	1

(b) What are natural variations and assignable variations in SQC?   [15 + 5]

8. (a) Determine the optimum sequence for processing the jobs shown below through two work centres in flow shop scheduling. Times at each centres are in hours.

Job	1	2	3	4	5	6	7
Work Centre 1	6	8	18	15	16	6	10
Work centre 2	12	7	9	10	8	8	5

Compute the throughput time for the optimum sequence of jobs obtained and the corresponding idle time at the two work centres.

(b) What is the difference between flow shop scheduling and job shop scheduling?   [16 + 4]