

B.E. CHEMICAL ENGINEERING FOURTH YEAR SECOND SEMESTER – 2024

INDUSTRIAL MANAGEMENT

Time: 3 hr

Full Marks: 100

Answer any five questions

(All parts of one question must be answered together)

1. a) Summarize F.W. Taylor's contributions to Scientific Management.
b) What is meant by Process layout? Discuss the same with a suitable diagram.
c) Draw and explain an Organization Chart for Line and Staff Organization Structure.
Discuss its advantages and disadvantages. [05+05+10]
2. Write short notes on (Any four): [05x04=20]
 - a) SIMO charts
 - b) JIT
 - c) Producer's risk Vs Consumer's risk
 - d) Network Crashing
 - e) Selective inventory control
 - f) Difference between PERT and CPM
 - g) Time & Motion study.
3. (a) Each year the Yellowstone Company purchases 18,000 of an item that costs Rs. 16 per unit. The cost of placing an order is Rs. 12, and the cost to hold the item for a year is 30 percent of the unit cost. Determine
 - i. the economic order quantity
 - ii. Optimal number of orders per year
 - iii. The optimal order cycle time
 - iv. Average inventory level assuming that the minimum inventory level is zero.(b) Derive the formula of the EOQ you use in part (a). [15+5]

[Turn over

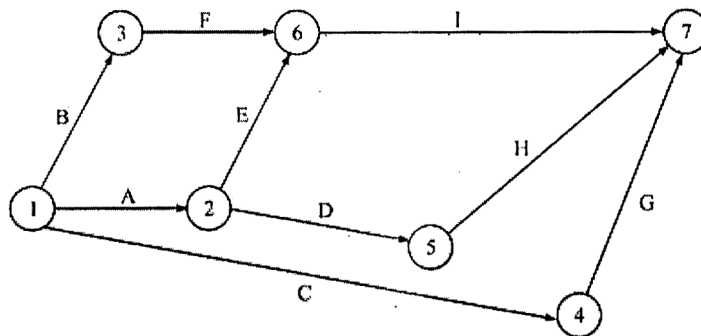
4. The data on normal time, normal cost and crash time, crash cost associated with a project are shown in the following table.

Activity	Normal		Crash	
	Time(weeks)	Cost (Rs)	Time (weeks)	Cost (Rs)
1 – 2	3	300	2	400
2 – 3	3	30	3	30
2 – 4	7	420	5	580
2 – 5	9	720	7	810
3 – 5	5	250	4	300
4 – 5	0	0	0	0
5 – 6	6	320	4	410
6 – 7	4	400	3	470
6 – 8	13	780	10	900
7 – 8	10	1,000	9	1,200
		4,220		

Indirect cost is Rs 50 per week. (a) Draw the network diagram for the project and identify the critical path. (b) What are the normal project duration and associated cost? (c) Find out the total float associated with non-critical activities. (d) Crash the relevant activities and determine the optimal project completion time and cost. [20]

5. The following network diagram represents activities associated with a project:

Activities	:	A	B	C	D	E	F	G	H	I
Optimistic time, t_0	:	5	18	26	16	15	6	7	7	3
Pessimistic time, t_p	:	10	22	40	20	25	12	12	9	5
Most likely time, t_M	:	8	20	33	18	20	9	10	8	4



Determine the following: (a) Expected completion time and variance of each activity (b) The earliest and latest occurrence times of each event. (c) The critical path. (d) The probability of completion time of the project within the due date of 41.5 weeks. (e) The duration of the project that will have 95 per cent chance of being completed. (For standard normal $Z=1.645$, area under the standard normal curve from 0 to Z is 0.45) [20]

6. A) Explain break even analysis with the help of a neat sketch.
 B) A manufacturing firm produces a single product whose selling price is 16 and variable cost per unit is 12. If the annual fixed costs of the firm are estimated as Rs 120000; find the break even points in units, in rupees, and as a percentage capacity, if the firm has estimated capacity of 50,000 units of the product. What is the margin of safety? [15+5]

7. A) Explain different EOQ models
 B) Explain ABC Analysis in inventory control. [12+8]

8. A) Use the graphical method to solve the following linear programming problem:

$$\text{Maximize } z = 7x_1 + 3x_2$$

$$\text{subject to: } x_1 + 2x_2 \geq 3$$

$$x_1 + x_2 \leq 4$$

$$0 \leq x_1 \leq 5/2$$

$$0 \leq x_2 \leq 3/2$$

$$\text{and } x_1, x_2 \geq 0$$

- B) Determine an initial basic feasible solution to the following transportation problem by using Vogel's approximation method.

Source		Destination				Supply
		D1	D2	D3	D4	
	S1	1	5	1	1	40
	S2	4	3	6	8	30
	S3	3	2	5	9	40
Demand		30	40	30	10	

[10+10]

9. A) Given the values of sample mean (\bar{X}) and the ranges(R) for ten samples of size 5 each. Draw the X, R charts and comment on the state of control of the process:

Sample No. :	1	2	3	4	5	6	7	8	9	10
\bar{X} :	43	49	37	44	45	37	51	46	43	47
R :	5	6	5	7	7	4	8	6	4	6

Given control limit factors: for n=5; for X charts. A=0.577 for R charts, B=2.114; C=0.000

- B) Explain acceptance sampling and OC curve.

- C) What is the difference between p-chart and c- chart? When it is used for? [10+5+5]