

**B. Ch. E 4<sup>th</sup> Year 2<sup>nd</sup> Semester Examination (Old) 2017****INDUSTRIAL MANAGEMENT**

Time : Three hours

Full Marks : 100

Answer any *five* questions  
taking atleast 2 questions from each Part

**PART - I**

Use graph paper for graphical solution, if any.

Assume/rectify necessary data if not given in the problems.

Answer all the parts of a question integrally. Fractional answering will be discredited.

*The figures in the margin indicate full marks along with break up.*

1. (a) Define the term 'Linear Programming'. Drawing explanatory figures discuss about Convex and Non-convex sets. What is an unbounded solution in linear programming?

(b) PQR- flour mill makes flour of three grades X, Y and Z. It has two flour mills A and B for which the costs of running per day are Rs. 1000 and Rs. 2000 respectively. It has received a contract from LMN- flour suppliers, which markets flour in branded packets throughout the country. In the contract, PQR has to supply LMN with 20, 18 and 25 quintals of flour of grades X, Y and Z respectively. Everyday mill A produces 4, 3 and 2 quintals, while mill B produces 2, 2 and 10 quintals of flour of grades X, Y and Z respectively. Formulate the above as a linear programming problem and determine the number of days for which mills should be operated to fulfill the contract most economically. (3+4+3) + (8+7) = 25

2. (a) XYZ mfg. co. is offering price discount facilities for a particular product to its customers as shown below. A retailer of the company at Jhansi has an annual demand of 2500 units of the said product. The carrying cost, as estimated by the retailer according to the past experience, is 10% of the price per product and the ordering cost is estimated at Rs.100 per order. Determine the size of the order the retailer should place with the company so that the total annual stocking cost is minimum. What is the feasible EOQ?

Number of units	Rs./unit
50-99	2000
100-149	1900
150 and above	1800

(b) With all necessary assumptions and stating about the legends develop economic production quantity model of inventory. Draw an explanatory figure in this regard. 15 + 10 = 25

3. (a) What are the general assumptions in Johnson's algorithm for scheduling-n-sequencing problem? What is modified Johnson's algorithm and how the algorithm is applied? Discuss clearly without considering any numerical value.

(b) Find out the sequence and corresponding schedule in the following case:

Job (j):	A	B	C	D	E	F	G
M1:	1	3	7	9	4	5	2
M2:	1	3	8	2	8	6	1
M3:	8	10	9	11	9	14	12

[M1→M2→M3]

(5+5) + 15 = 25

4. (a) Discuss clearly about ABC inventory analysis.  
 (b) Discuss about the factors which affect demand/sales forecasting. Draw necessary graphs.  
 (c) Defining the terms properly, discuss how correlation and regression technique is applied in demand/sales forecasting.  
 (d) Write a brief note on span of control, tall and short organization structures.  
 (e) Discuss about F.W. Taylor's concept of selection, training and motivation. 5 × 5 = 25

5. (a) Times in minutes of different operations in the shipping department of a company are furnished below:

Work element	Cycle				Performance Rating
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	
Obtain the case	0.15	0.25	0.20	0.17	90%
Place 3-dozens bottle in the case	1.56	29.35	1.80	1.75	105%
Set case aside	0.20	0.10	0.10	0.15	95%

The operator takes 0.50 minute for personal requirement. Find out the standard time of the task.

(b) What is 'THERBLIGS'? Discuss its importance in time study method.

(c) Discuss about camera study methods.

(d) Drawing an explanatory diagram discuss about a flow process chart considering at least ten different activities.  $8+6+4+7 = 25$

6. (a) Distinguish between PERT and CPM as applicable in network management.

(b) Activity:	A	B	C	D	E	F	G	H	I	J
Predecessor(s):	nil	A	A	A	A	B,C	F,D,E	E	F	I,G,H

Draw the AOA network diagram in the above case. If the activity times (in time unit) of A,B,C,D,E,F,G,H,I and J are 17,12,13,9,13,22,11,8,10 and 5 respectively, then find out the critical path and project duration. Tabulate all the values indicating the formula used.  $5 + 20 = 25$

7. (a) A manufacturer produces 10000 flow valves during a 10 day period. He draws random samples of 50 flow valves twice a day. The number of defectives are as follows:

Sample no.:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
No. of defective:	9	6	13	3	9	2	11	9	14	5	8	9	13	20	15	7	12	8	3	4

Construct a fraction defective chart and conclude accordingly.

(b) Defining Type I and Type II errors, discuss about an O.C. curve.

(c) With proper examples define the terms 'attributes' and 'variables'. What are the advantages of SQC? How it is done in the shop floor?  $10 + 8 + (2+2+1+2) = 25$

**PART - II**

1. (a) Historical demand for a product is:

Month	April	May	June	July	August	September
Actual	60	55	75	60	80	75

- Using a simple four-month simple moving average, calculate a forecast for October.
- Using a four-month weighted moving average with weights of .4, .3, .2, and .1, calculate a forecast for October.
- Using single exponential smoothing with  $\alpha = 0.3$  and August forecast = 65, calculate a forecast for October.

(b) Discuss the components of a time series in forecasting.

(c) What are different approaches to forecasting? [12+4+4]

2. (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

- the economic order quantity
- Optimal number of orders per year
- The optimal order cycle time
- Average inventory level assuming that the minimum inventory level is zero.
- Total cost comprising total annual ordering cost and the carrying cost if the EOQ is used.

(b) Derive the formula of the EOQ you use in part (a).

(c) What is the significance of EOQ in inventory management? [12+4 +4]

3. (a) Find the optimum sequence of jobs for processing them through two work centres in flow shop scheduling. Times at each centre are in hours.

Job	A	B	C	D	E	F	G	H
Work Centre 1	10	8	12	11	10	12	10	5
Work centre 2	2	7	8	16	8	8	14	3

Compute the throughput time or makespan for the optimum sequence of jobs obtained in part (a) and the corresponding idle time at the two work centres.

(b) For a company following data is available.

Fixed cost = Rs.  $3 \times 10^5$ ; variable cost /unit product = Rs. 400; price/unit product = Rs. 600. Determine the break-even volume.

(c) What is the significance of the break-even volume? [12+5 +3]

[ Turn over

4. (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.

		Destination				Supply
		D1	D2	D3	D4	
Source	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]

5. (a) Given below are a group of jobs. Develop a network based on activity-on-arrow (AOA) for these jobs, minimizing as far as possible the number of pseudoactivities. Also, determine the critical path.

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
Normal time (days)	5	4	3	2	2	4	3	6	5	2	2	3

- (b) What is the significance of the critical path in project management? [15 + 5]

6. (a) Data-entry clerks at ARCO key in thousands of insurance records each day. Samples of the work of 10 clerks are shown in the table. One hundred records entered by each clerk were carefully examined and the number of errors counted. Set the control limits to include 99.73% of the random variation in the entry process when it is in control. Construct the suitable control chart. Comment on your results.

Sample No.	1	2	3	4	5	6	7	8	9	10
No. of errors	6	5	0	1	8	7	11	6	2	5

- (b) Discuss about an O.C curve with a diagram.

- (c) Distinguish between natural variations and assignable variations. [12 + 6 + 2]

7. (a) A work operation consisting of three elements has been subjected to a stopwatch time study. The recorded observations are shown in the following table. By union contract, the allowance time for the operation is personal time 5%, delay 5%, and fatigue 12%. Determine the standard time for the work operation.

Job element	Operations (minutes)						Performance rating (%)
	1	2	3	4	5	6	
A	.2	.3	.1	.8	.2	.1	90
B	.8	.5	.7	.5	2.2	.7	110
C	.5	.4	.5	.6	.5	.6	80

(b) What are 'Therbligs' and 'TMUs' in work measurement? [15+5]

8. Write short notes on any four of the following:

- (a) Matrix organization structure
- (b) 'Authority', 'responsibility', and 'delegation'
- (c) ABC inventory analysis
- (d) Type I and Type II errors
- (e) Process focus
- (f) Repetitive focus
- (g) Graphical method of scheduling
- (h) Quantity discount in inventory management

[20]

**END**