

PGDM, 2017-19
Operations Management
DM-209

Trimester-II, End Term Examination, December 2017

Time allowed: 2 hr 30 min

Max Marks: 50

Roll No: _____

Instruction: Students are required to write Roll No on every page of the question paper, writing anything except the Roll No will be treated as **Unfair Means**. In case of rough work, please use answer sheet.

Section A: Short answer questions (Five marks each. Attempt three; total marks 15)

- A1. Cost-quality tradeoff implies that to produce and sell high quality products a business would incur high cost as well. At the same time, according to Crosby 'quality is free'. How would you resolve this paradox?
- A2. State any three advantages of design simplification.
- A3. A batch or job-shop production system is characterized by a process layout. Why? State any three attributes of a process layout.
- A4. A) What do you mean by process capability ratio? How does it differ from process capability index? (2 marks)
B) The Meghna Company manufactures parts for an aircraft company using three computerized numerical controlled (CNC) turning centers. The company wants to decide which machines are capable of producing a specific part with design specifications of $0.0970 \text{ cm} \pm 0.015 \text{ cm}$.
The machines have the following process parameters:

Sr. No.	Machine Process mean (cm)	Standard deviation (cm)
1.	0.0995	0.004
2.	0.1002	0.009
3.	0.0950	0.005

Determine which machines (if any) are capable of producing the part. (3 marks)

- A5. Ola receives several complaints per day about the behavior of its drivers. Over a 6-weeks period (where weeks are the units of measure), a customer care representative received the following numbers of calls from irate passengers: 18, 10, 4, 6, 12 and 10 for a total of 60 complaints. Customer care representative wants to develop an appropriate chart at 99.73% ($z = 3$) level. Compute the control limits for such a chart.

Section B: 10 marks each. Attempt any 2; total marks 20

B1. The R&D department is planning to bid on a large project for the development of a new communication system for commercial planes. The accompanying table shows the activities, times and sequences required.

Activity	Immediate Predecessor	Times (Days)		
		a	m	B
A	-----	1	3	5
B	-----	1	2	3
C	A	1	2	3
D	A	2	3	4
E	B	3	4	11
F	C, D	3	4	5
G	D, E	1	4	6
H	F, G	2	4	5

- Draw the network diagram (AON).
- What are the slacks for the activities? Hence, what is the critical path?
- What is the expected project completion time?
- What is the probability of completing this project within 16 days?
- What is the probability that the project will take more than 17 days to complete?

[2 x 5 Marks]

B2. A manufacturer buys cardboard boxes from a supplier. The monthly demand is 3000 boxes and is uniform throughout the year. The cost of each box is Rs. 4.00. The estimated order cost is Rs. 6.00 and the annual carrying cost is 30% of the value of the inventory.

- What are the EOQ, the annual ordering & carrying cost? (6 marks)
- If the actual demand turns out to be 6000 per month, and you have used the EOQ as calculated in part (a), what would be the annual ordering & carrying cost? (4 marks)

B3. From the data of 16 Kg rice filling operations displayed in the table below, compute the lower and upper control limits of \bar{x} bar and R charts. After the process has settled down, hourly samples of 20 sacks have been drawn, and averages and ranges have been computed. A total of 12 samples were drawn. Is the process in control? (7 + 3 marks)

Sample No.	Sample Mean	Sample Range	Sample No.	Sample Mean	Sample Range
	Kgs	Kgs		Kgs	Kgs
1	16.20	2.00	7	16.00	2.90
2	15.90	2.10	8	16.10	1.80
3	16.30	1.80	9	16.30	1.50
4	16.40	3.00	10	16.30	1.00
5	15.80	3.50	11	16.40	1.00
6	15.90	3.10	12	16.50	0.90

Section C: 15 marks

Rejoice Ltd. produces a variety of recreation and leisure products. The production manager has developed an aggregate forecast:

Month	Apr	May	Jun	Jul	Aug	Sep	Total
Forecast	44	55	60	50	40	51	300

Use the following information to develop aggregate plans:

Regular Production Cost	\$ 80 per unit	Subcontracting capacity	12 units per month
Overtime production cost	\$ 120 per unit	Holding cost	\$ 10 per unit per month
Regular Capacity	40 units per month	Shortage cost	\$ 20 per unit
Overtime Capacity	8 units per month	Beginning Inventory	0 unit
Subcontracting cost	\$ 140 per unit		

Develop an aggregate plan using each of the following guidelines and compute the total cost for each plan.

- i. Chase demand: Use regular production. Supplement using inventory, overtime, and subcontracting as needed. No shortages allowed.
[6 Marks]
- ii. Level strategy: Use a combination of backlogs, subcontracting, and inventory to handle variations in demand. No overtime allowed.
[6 Marks]
- iii. Which plan has the lowest total cost? [3 Marks]

n	A ₂	D ₃	D ₄	A ₃	B ₃	B ₄
2	1.88	0	3.27	2.66	0	3.27
3	1.02	0	2.57	1.95	0	2.57
4	0.73	0	2.28	1.63	0	2.27
5	0.58	0	2.11	1.43	0	2.09
6	0.48	0	2.00	1.29	0.03	1.97
7	0.42	0.08	1.92	1.18	0.12	1.88
8	0.37	0.14	1.86	1.10	0.19	1.81
9	0.34	0.18	1.82	1.03	0.24	1.76
10	0.31	0.22	1.78	0.98	0.28	1.72
11	0.29	0.26	1.74	0.93	0.32	1.68
12	0.27	0.28	1.72	0.89	0.35	1.65
13	0.25	0.31	1.69	0.85	0.38	1.62
14	0.24	0.33	1.67	0.82	0.41	1.59
15	0.22	0.35	1.65	0.79	0.43	1.57
16	0.21	0.36	1.64	0.76	0.45	1.55
17	0.20	0.38	1.62	0.74	0.47	1.53
18	0.19	0.39	1.61	0.72	0.48	1.52
19	0.19	0.40	1.60	0.70	0.50	1.50
20	0.18	0.41	1.59	0.68	0.51	1.49

Sample No.	Mean	Range	Sample No.	Sample Mean	Sample Range
1	15.20	2.40	7	15.30	1.80
2	15.30	2.10	8	15.10	1.80
3	15.40	1.90	9	15.30	1.80
4	15.50	1.70	10	15.30	1.80
5	15.60	1.50	11	15.40	1.70
6	15.70	1.30	12	15.50	1.60