PGDM, 20-22
Operations Management
DM-206
Trimester-II, End Term Examination, January 2021

Time allowed: 2 hr. 30 min. Max Marks: 50

Instruction:

I. In section A, the first five questions are of 5 marks, and the next three questions are of 10 marks each. Attempt questions worth 30 marks from this section by choosing any combination of 5 marks and 10 marks questions. Extra attempts will be penalized.

II. There is no choice in section B.

Section A

A1. Discuss the requirements from an operations perspective of competing on following attributes: (a) quality, (b) cost, (c) flexibility, (d) speed, (e) innovation, and (f) service.

[CILO 1: 5 Marks]

A2. ABC company makes ceramic vases for a chain of department stores. The output and cost figures over the past four weeks are shown here. Labour costs $10 an hour, and materials are $4 a pound. Calculate the (a) labour productivity (in hrs), (b) material productivity (in lbs), and (c) multifactor productivity for each week. Comment on the results.

Weeks	Units of Output	No. of Workers	Hours per week per worker	Material Used (lbs)
1	2000	4	40	286
2	4000	4	48	570
3	5000	5	56	720
4	7000	6	70	1000

[CILO 1: 5 Marks]

A3. Elon Corporation manufactures parts for an aircraft company. It uses a computerized numerical controlled (CNC) machining center to produce a specific part that has a design (nominal) target of 1.275 inches with tolerances of ±0.024 inch. The CNC process that manufactures these parts has a mean of 1.281 inches and a standard deviation of 0.008 inch. Compute the process capability ratio and process capability index, and comment on the overall capability of the process to meet the design specifications.

[CILO 3: 5 Marks]

A4. As a regional sales manager, Nora Burke travels frequently and relies on her cell phone to keep up to date with clients. She has tried three different service providers,

Airtel, Idea, and Vodafone, with varying degrees of success. The number of failures in a typical eight-hour day and the average time to regain service when a failure occurs are shown below. Nora's contract is up for renewal. Which cellular service should she use?

Cellular Co.	**Number of Failures**	**Time to Regain Service (min)**
Airtel	10	2
Idea	8	4
Vodafone	3	10

[CILO 2: 5 Marks]

A5. Given the following load summary chart, design a layout on a 2X3 grid that will minimize nonadjacent loads.

	Load Summary Chart				
From/To	1	2	3	4	5
1	-		50		25
2		-	20		100
3	30	10	-		75
4				-	
5					-

[CILO 2: 5 Marks]

A6. The maintenance department of large hospital uses about 816 cases of liquid cleanser annually. Ordering costs are $12, carrying costs are $4 per case a year and the new price schedule indicates that orders of less than 50 cases will cost $20 per case, 50 to 79 cases will cost $18 per case, 80 to 99 cases will cost $17 per case, and larger orders (100 and more) will cost $16 per case. Determine the optimal order quantity and the total cost.

[CILO 2: 10 Marks]

A7. The activity data for a project are given below:

Activity:	**A**	**B**	**C**	**D**	**E**
Precedence	-	-	A	B, C	A
Optimistic Time	5	4	4	3	16
Most Likely time	6	5	15	4	17
Pessimistic Time	7	18	20	5	18

Determine the following

a. Expected task time and variances.
b. The earliest and latest expected times for each activity.
c. The critical path (using the slack).
d. Probability that the project will be completed between 18 and 26 days.

[CILO 3: 2+4+2+2 Marks]

A8. Best Vision is revamping its assembly lines to improve efficiency. As shown below, there are 10 steps to assembling a television set.

a. If Best needs to produce 120 televisions in a 40-hour work week, how should the line be balanced? Given that one worker is assigned to each workstation, how many workers are required to operate the line? What is the efficiency of the line?

b. If demand for televisions is reduced to 100 sets per 40-hour week, how many workers will be needed to man the line? Re-balance the line and re-calculate its efficiency.

Task	A	B	C	D	E	F	G	H	I	J
Precedence	--	A	A	A	B	C, E	D	G	F, H	I
Time (min)	8	4	7	3	7	11	2	8	5	7

[CILO 3: 6+4 Marks]

Section B

XYZ is a popular food item during the fall and winter months, but it is marginal in the spring and summer. Use the following demand forecasts and costs to determine which of the following production planning strategies is best for XYZ company.

c. Level production over the 12 months.

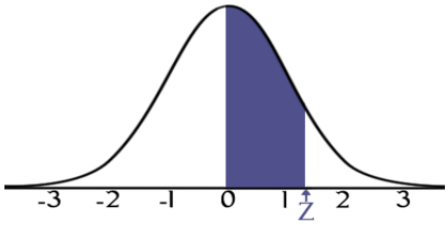
d. Produce to meet demand each month. Absorb variations in demand by changing the size of the workforce.

e. Keep the workforce at its current level. Supplement with overtime and subcontracting as necessary.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Demand	2000	1000	1000	1000	1000	1500	2500	3000	9000	7000	4000	3000

Overtime capacity per month	:	equal to regular production
Subcontracting capacity per month	:	unlimited
Regular production cost	:	$ 30 per pallet
Overtime production cost	:	$ 40 per pallet
Subcontracting cost	:	$ 50 per pallet
Holding cost	:	$ 2 per pallet
Beginning workforce	:	10 workers
Production rate	:	200 pallets per worker per month
Hiring cost	:	$ 5000 per worker
Firing cost	:	$ 8000 per worker

[CILO 2: 20 Marks]



STANDARD NORMAL TABLE (Z)

Entries in the table give the area under the curve between the mean and *z* standard deviations above the mean. For example, for $z = 1.25$ the area under the curve between the mean (0) and z is 0.3944.

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0190	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2969	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3513	0.3554	0.3577	0.3529	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998