

PGDM & PGDM (IB), 2020-22

Supply Chain Management

DM-443/IB-443

Trimester-IV, End Term Examination: September 2021

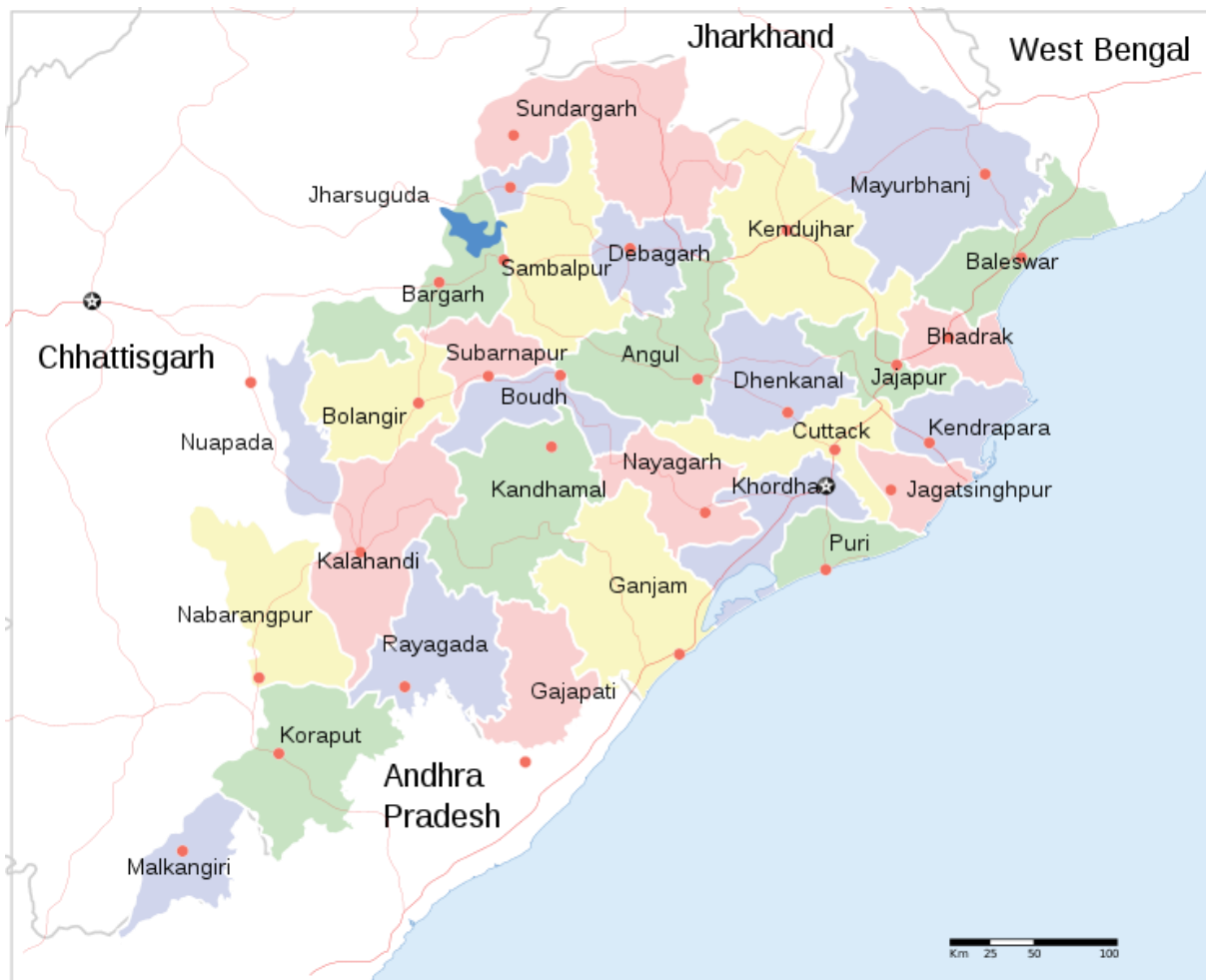
Time allowed: 2 hr 30 min

Max Marks: 50

Instruction: This question paper consists of three sections, A, B, and C. Answer to Section B will need to be uploaded as a separate file. Thus, you will need to upload two files – one for your attempts for Sections A and C, and another for Section B.

Section A: Please attempt all questions. Internal choices are given in some questions. (Total marks 20)

1. Containing the potential damage that could have been caused by the cyclone Yaas, thousands of people in Orissa were shifted to relief camps in the five districts of Puri, Jagatsinghpur, Kendrapara, Bhadrak, and Baleswar. Food, medicines and other relief materials were to flow to these camps from Cuttack. Drawing from past experience when these items would be shipped directly to the camps from the central control room at Cuttack, the NDRF was wondering whether to set up some temporary distribution centres closer to the camps, in which case the relief material would first flow from Cuttack to these DCs and then to the relief camps.



What would your advice to the NDRF be? Why? What factors would you consider to arrive at a decision? How would you decide how many temporary DCs to set up? Please be brief (bullet points would be preferred).

OR

A product firm faces very high demand uncertainty. According to published empirical data, its products should enjoy high margins. But the firm's product margins are poor. What could be the possible reasons? Please be brief (bullet points would be preferred).

(CLO 1; 5 marks)

2. Consider the following distribution system:

- Single product
- Two plants, referred to as P1 and P2
- Plant P2 has an annual capacity of 60,000 units; the capacity of P1 is not a constraint
- The two plants have the same production costs
- Two existing warehouses, referred to as W1 and W2, have identical warehouse handling costs
- Three market areas: C1, C2 and C3, with demands of 50,000, 100,000 and 50,000 units respectively

The following table provides distribution cost per unit. For instance, distributing one unit from plant P1 to warehouse W2 costs \$5, and distributing one unit from W1 to market C2 costs \$4.

Distribution costs per unit					
Facility Warehouse	P1	P2	C1	C2	C3
W1	0	4	3	4	5
W2	5	2	2	1	2

The Company's objective is to find a distribution strategy that specifies the flow of products from the suppliers through the warehouses to the market areas without violating the plant P2 production capacity constraint that satisfies market demands, and minimizes the total distribution costs.

Formulate the problem as a network optimization model, while writing down the objective function and the constraints. Use symbols and subscripts of your choice.

(CILO 1; 5 marks)

3. Green Thumb, a manufacturer of lawn care equipment, has introduced a new product. Each unit costs Rs. 10,500 to manufacture and is expected to sell at Rs. 14,000. At this price, the anticipated demand is normally distributed with a mean of 1000 and a standard deviation of 400 units. Any unsold units at the end of the season will be disposed of in a post-season sale for Rs. 3,500 each.
 - a. How many units should Green Thumb manufacture for sale?
 - b. What is the expected profit?
 - c. How many customers does Green Thumb expect to turn away because of stocking out?

(CILO 2; 4 + 4 + 2 marks)

Section B (10 marks)

4. Assuming that you work with an Automotive OEM manufacturer, how would you go about the process of finalizing a supplier / vendor for the supply of a critical component, such as "GEARS"? Please share a step-by-step process with your comments about key elements of each step of the process till placement of the final Purchase Order.

OR

What are the factors that you will consider when evaluating the performance of a supplier? From your personal experience or from a real or hypothetical example of a supply chain, create and present a template for evaluating the performance of a set of your suppliers, including identifying each performance parameter (with clear numerical basis) and providing weightages to each element.

(CILO 3; 10 marks)

Section C (20 marks)

5. Epson produces printers for sale in Europe in its Taiwan factory. Printers sold in different countries differ only in terms of the power outlet and the language of manuals, with the base machine being common. Currently, Epson assembles and packs printers for different countries at its plant in Taiwan and ships them to a central DC in Europe, based on orders placed by the European CDC. Weekly demand in different countries is normally distributed with means and standard deviations as shown in the table below:

Weekly Demand for Epson Printers in Europe		
Country	Mean Demand	Standard Deviation
France	300	200
Germany	400	220
Spain	200	140
Italy	250	160
Portugal	100	80
UK	400	240

- a. Assume demand in different countries to be independent. Given that the lead time from the Taiwan factory is eight weeks, how much total safety inventory of different models does Epson require at the European CDC, if it targets a CSL of 95 percent? **(6 marks)**
- b. Epson decides to ship printers (without power supply) to the European CDC. The CDC will assemble power supplies, add manuals, and ship the printers to the appropriate country. The base printers are still to be manufactured in Taiwan with a lead time of eight weeks. How much safety inventory should the European CDC carry now? **(6 marks)**
- c. Each printer costs Epson Rs.10, 000/- and the annual holding charge is 25 percent. What saving in holding cost can they expect as a result of the move mentioned above? If finally, assembly operations in the European CDC add Rs.45 to the production cost of each printer, would you recommend the move? Justify your answer. **(8 marks)**

(Please assume that the European CDC monitors the inventory of printers on a continuous basis)

(CILO 2)

Z-Chart & Loss Function

$F(Z)$ is the probability that a variable from a standard normal distribution will be less than or equal to Z , or alternately, the service level for a quantity ordered with a z -value of Z .

$L(Z)$ is the standard loss function, i.e. the expected number of lost sales as a fraction of the standard deviation. Hence, the lost sales = $L(Z) \times \sigma_{\text{DEMAND}}$

Z	F(Z)	L(Z)	Z	F(Z)	L(Z)	Z	F(Z)	L(Z)	Z	F(Z)	L(Z)
-3.00	0.0013	3.000	-1.48	0.0694	1.511	0.04	0.5160	0.379	1.56	0.9406	0.026
-2.96	0.0015	2.960	-1.44	0.0749	1.474	0.08	0.5319	0.360	1.60	0.9452	0.023
-2.92	0.0018	2.921	-1.40	0.0808	1.437	0.12	0.5478	0.342	1.64	0.9495	0.021
-2.88	0.0020	2.881	-1.36	0.0869	1.400	0.16	0.5636	0.324	1.68	0.9535	0.019
-2.84	0.0023	2.841	-1.32	0.0934	1.364	0.20	0.5793	0.307	1.72	0.9573	0.017
-2.80	0.0026	2.801	-1.28	0.1003	1.327	0.24	0.5948	0.290	1.76	0.9608	0.016
-2.76	0.0029	2.761	-1.24	0.1075	1.292	0.28	0.6103	0.274	1.80	0.9641	0.014
-2.72	0.0033	2.721	-1.20	0.1151	1.256	0.32	0.6255	0.259	1.84	0.9671	0.013
-2.68	0.0037	2.681	-1.16	0.1230	1.221	0.36	0.6406	0.245	1.88	0.9699	0.012
-2.64	0.0041	2.641	-1.12	0.1314	1.186	0.40	0.6554	0.230	1.92	0.9726	0.010
-2.60	0.0047	2.601	-1.08	0.1401	1.151	0.44	0.6700	0.217	1.96	0.9750	0.009
-2.56	0.0052	2.562	-1.04	0.1492	1.117	0.48	0.6844	0.204	2.00	0.9772	0.008
-2.52	0.0059	2.522	-1.00	0.1587	1.083	0.52	0.6985	0.192	2.04	0.9793	0.008
-2.48	0.0066	2.482	-0.96	0.1685	1.050	0.56	0.7123	0.180	2.08	0.9812	0.007
-2.44	0.0073	2.442	-0.92	0.1788	1.017	0.60	0.7257	0.169	2.12	0.9830	0.006
-2.40	0.0082	2.403	-0.88	0.1894	0.984	0.64	0.7389	0.158	2.16	0.9846	0.005
-2.36	0.0091	2.363	-0.84	0.2005	0.952	0.68	0.7517	0.148	2.20	0.9861	0.005
-2.32	0.0102	2.323	-0.80	0.2119	0.920	0.72	0.7642	0.138	2.24	0.9875	0.004
-2.28	0.0113	2.284	-0.76	0.2236	0.889	0.76	0.7764	0.129	2.28	0.9887	0.004
-2.24	0.0125	2.244	-0.72	0.2358	0.858	0.80	0.7881	0.120	2.32	0.9898	0.003
-2.20	0.0139	2.205	-0.68	0.2483	0.828	0.84	0.7995	0.112	2.36	0.9909	0.003
-2.16	0.0154	2.165	-0.64	0.2611	0.798	0.88	0.8106	0.104	2.40	0.9918	0.003
-2.12	0.0170	2.126	-0.60	0.2743	0.769	0.92	0.8212	0.097	2.44	0.9927	0.002
-2.08	0.0188	2.087	-0.56	0.2877	0.740	0.96	0.8315	0.090	2.48	0.9934	0.002
-2.04	0.0207	2.048	-0.52	0.3015	0.712	1.00	0.8413	0.083	2.52	0.9941	0.002
-2.00	0.0228	2.008	-0.48	0.3156	0.684	1.04	0.8508	0.077	2.56	0.9948	0.002
-1.96	0.0250	1.969	-0.44	0.3300	0.657	1.08	0.8599	0.071	2.60	0.9953	0.001
-1.92	0.0274	1.930	-0.40	0.3446	0.630	1.12	0.8686	0.066	2.64	0.9959	0.001
-1.88	0.0301	1.892	-0.36	0.3594	0.605	1.16	0.8770	0.061	2.68	0.9963	0.001
-1.84	0.0329	1.853	-0.32	0.3745	0.579	1.20	0.8849	0.056	2.72	0.9967	0.001
-1.80	0.0359	1.814	-0.28	0.3897	0.554	1.24	0.8925	0.052	2.76	0.9971	0.001
-1.76	0.0392	1.776	-0.24	0.4052	0.530	1.28	0.8997	0.047	2.80	0.9974	0.001
-1.72	0.0427	1.737	-0.20	0.4207	0.507	1.32	0.9066	0.044	2.84	0.9977	0.001
-1.68	0.0465	1.699	-0.16	0.4364	0.484	1.36	0.9131	0.040	2.88	0.9980	0.001
-1.64	0.0505	1.661	-0.12	0.4522	0.462	1.40	0.9192	0.037	2.92	0.9982	0.001
-1.60	0.0548	1.623	-0.08	0.4681	0.440	1.44	0.9251	0.034	2.96	0.9985	0.000
-1.56	0.0594	1.586	-0.04	0.4840	0.419	1.48	0.9306	0.031	3.00	0.9987	0.000
-1.52	0.0643	1.548	0.00	0.5000	0.399	1.52	0.9357	0.028			