PGDM (IB), 2016-18

Operations Management

IB307

Trimester –III, End-Term Examination: March 2017

Time allowed: 2 Hours 30 mins. **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.

Sections	No. of Questions to attempt	Marks	Marks
A	3 out of 5 (Short Questions)	5 Marks each	3*5 = 15
B	2 out of 3 (Long Questions)	10 Marks each	3*10 = 20
C	Compulsory Case Study	15 Marks	15
		Total Marks	**50**

SECTION A

Q1. What do we mean by the statement, 'aggregated forecasts are more accurate'? Explain with an example.

Q2. Student Tuition at ABC University is Rs. 100.00 per semester credit hour. The ABC Foundation supplements school revenue by matching student tuition, rupee for rupee. Average class size for a typical three-credit course is 50 students. Labour costs are Rs 4000.00 per class, material costs are Rs 20.00 per student per class, and overhead costs are Rs 25000.00 per class.

(i) What is the multifactor productivity ratio?

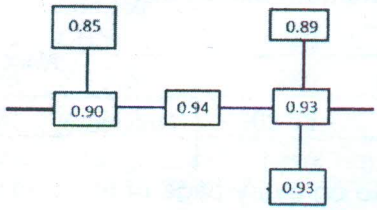
(ii) If instructors work an average of 14 hours per week for 16 weeks for each three-credit class of 50 students, what is the labour productivity ratio?

Q3. Compare the process and product layouts on the basis of any five parameters? Also differentiate between the A type and V type production flow?

Q4. Operation is often defined as a transformation process. Inputs such as raw materials, labour, equipment, and capital are transformed into outputs (goods and services). Consider an e-retailer like Amazon. What are its primary transformation processes? What are the inputs and outputs? How are the inputs transformed into outputs?

Q5. In functional design, we are concerned with the parameters that determine the performance of the product in use.

a. Briefly describe these parameters.
b. What is the overall reliability of the following system?



SECTION B

Q1. From the data of 16 Kg rice filling operations displayed in the table below, compute the lower and upper control limits of x bar and R charts. After the process has settled down, hourly samples of 20 sacks have been drawn, averages and ranges were computed. A total of 12 samples were drawn. Is the process in control?

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

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

Q2. Consider the following project information

Activity	Activity Time (Week)	Immediate predecessors
A	4	--
B	3	--
C	5	--
D	3	A,B
E	6	B

F	4	D,C
G	8	E,C
H	12	F,G

(i) Draw the network diagram for this project. (3 marks)
(ii) Specify the critical path(s). (2 marks)
(iii) Calculate the total slack for the activities A & D. (5 marks)

Q3.
1. "The process of prioritizing jobs in a process is called as Sequencing" then please brief as to when to use the following rules
a. SPT (Shortest processing time)
b. Johnson's Rule
c. DDATE (Earlier due date)
d. FCFS. (First come first serve)

2. Johnson's Fine Restoration has received a rush order to refinish five carousel animals- an alligator, a bear, a cat, a deer and an elephant. The restoration involves two major processes; sanding and painting. Mr. Naman takes care of the sanding; his friend Mr. Karan does the painting. The time required for each refinishing job differs by the state of disrepair and degree of detail of each animal. Given the following processing time (in hours), determine the order in which the jobs should be processed so that the rush order can be completed as soon as possible.

Job	Process 01	Process 02
A	6	8
B	11	6
C	7	3
D	9	7
E	5	10

SECTION C

GE Aircraft Engines (GEAE) is the world's leading producer of large and small jet engines for commercial and military aircraft. It also supplies aircraft-derived engines for marine applications and provides aviation services. GEAE's technological excellence, supported by continuing substantial investments in research and development, has been the foundation of growth and helps to ensure quality products for customers. In the early 1990s, GE developed the GE90 turbofan engine to power the large, twin-engine Boeing777. The GE90 family, with the baseline engine certified on the 777 in 1995, has produced a world record steady-thrust level of 122,965 pounds. To honour this achievement, the GE90-115B was recently named 'the world's most powerful jet engine' by the Guinness Book of World Records. The latest GE90, the GE90-115B, has the world's largest fan (128 inches), composite fan blades, and the highest engine bypass ratio (9:1) to produce the greatest propulsive efficiency of any commercial transport engine.

GEAE has its service parts operation, which supplies parts for its commercial jet engines from an inventory of around 8,000 parts. In 1992, the company's system was confined to forecasting average monthly demand. There were 12 inventory planners with no idea how to identify trends, how to track forecast errors, and how to make provisions for seasonal variations. During this time, the airline industry started facing problems of various sorts and GEAE was forced to reduce costs. The inventory planners were reduced from 12 to 8, with

clear instructions to reduce the service parts inventory.

GEAE performed the ABC analysis of its parts and identified that 5 per cent of its parts generated 80 per cent of its business. These 5 per cent parts (called A+ items) were assigned to five inventory planners for micromanaging using a pull-production process. The rest 95 per cent of the parts were assigned to the remaining three planners. Most of these parts
did not have smooth demand patterns. Thus, GEAE required a forecasting tool that could handle lumpy and intermittent demand trends. Five hundred items were randomly selected in a pilot test in order to determine how to use selectable forecast calendars to solve forecasting problems.

Initially, for every part, the forecasting calendar is monthly. If the number of units required for a part is less than four per year, the part is put on a semi-annual calendar and refit. If the number of units required for a part is more than four but less than 60 per year, the part is put on a quarterly calendar. If the number of units required for a part is more than 60 but less than 120 per year, the part is put on a bi-monthly calendar. If the number of units required for a part is more than 120 per year, the part is kept on a monthly calendar. A part whose demand has declined for so long that it has essentially reached zero is fitted on a longer duration forecast calendar to make the forecast usable. For example, a part initially on a monthly calendar is moved onto a bimonthly, quarterly, semi-annual, or an annual calendar until its forecast becomes positive. Otherwise, the part is put on an exception list for a manual review.

Once the right calendar is selected for a part, the forecast model accurately represents the underlying demand for the part, resulting in a very low forecasting error. The forecast is revised from time to time to keep the model current with reality by making incremental changes. It also identifies the parts for which the chosen forecast calendar is suspected to be no longer working (i.e., requires fundamental rather than incremental changes). It alerts the planners to investigate the cause of change (e.g., new competition or product changes).

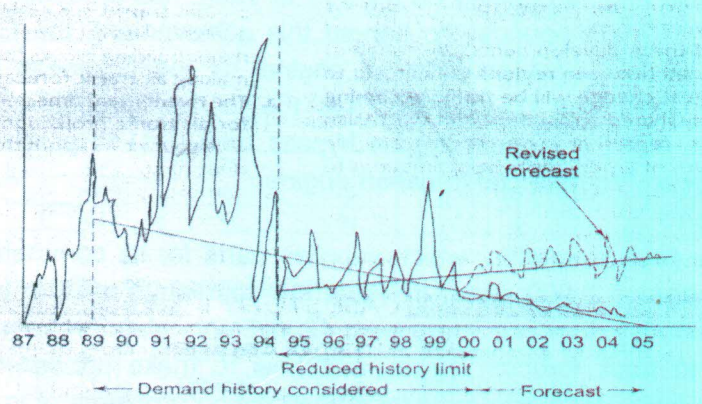


Fig. 15.49

While reviewing the exception list, the planners try all calendars for every part in the list and rank them by forecast error. For example, Table 15.8 shows the calculations of error for various calendars for part 3872. Note that for the various calendars, the forecasts are similar, ranging from 23 to 25 pieces per year, but the errors from the

actual demand range from 4.1 to 9.6. The error given here is the standard deviation of the forecast error adjusted for the lead time (for any desired level of service, safety stocks are a constant multiple of the error). Thus, the semiannual calendar, whose error is only 42.7 per cent of the error using the monthly calendar, needs only 42.7 per cent of the safety stock, compared to the monthly calendar, resulting in an inventory savings of 57.3 per cent

Table 15.8 Calendar comparison for part 3872

Calendar	*Exceptions*	*Number of history periods*	*Forecast for coming 12 months (in units)*	*Error*	*Relative error (%)*
Semi-annual	None	6	23	4.1	42.71
Annual	None	3	23	5.4	56.25
Quarterly	None	12	24	6.2	64.58
Bimonthly	Error > level	24	25	7.8	81.25
Monthly	Error > level	48	25	9.6	100.00

As discussed earlier, the forecast calendar may have to be revised in response to an exception. The reason for exceptions is often found by using outside marketing intelligence and then fixed. The demand history limits may be used by planners to fine-tune the exact date the change became apparent. The history that is inappropriate may be discarded. In Fig. 15-49, note that the history limit considered was inappropriate, leading to a linear regression forecast with a high forecast error. Upon reducing the history limit as shown in the figure, the forecast fits the relevant data much better (Beck 1999).

Discussion Questions

1. How does the selectable forecast calendar approach help GEAE in inventory reduction? Explain in the context of part 3872?

2. Was it necessary for GEAE to perform the ABC analysis of parts? Does it help in inventory reduction?

3. Can the use of control limits help GEAE in its overall effort of inventory control?