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Internal Test -II May 2017

Sub:	Operations Management			Code:	10ME81
Date: 08/05/17	Duration: 90 mins	Max Marks: 50	Sem: 8TH	Branch:	ME

Note: Answer any five questions, Missing data if any may be assumed suitably:

Q.No.	Question	OBE Marks	CO	RBT
1	What is a Plant Layout? Briefly explain different types of plant layout with their relative merits and demerits?	[10]	CO1	L1
2	Demand forecast for the product is given below along with the data on feasible production alternatives. Develop an optimal aggregate plan and determine the minimum cost. **Period / Expected Demand / Capacity Limits (Regular, overtime, subcontract)** **1 — 3000 — 2900 — 500 — 300** **2 — 2000 — 3000 — 400 — 300** **3 — 2500 — 2900 — 500 — 300** **Initial Inventory= 100 Final Inventory = 50 Regular Production cost= Rs 900** **Overtime cost= Rs1000 subcontract cost = Rs1300 back order cost = Rs100/unit/period Inventory carrying cost/unit/period =Rs10**	[10]	CO3	L3
3	What do you understand by aggregate planning? List and explain aggregate planning strategies and costs	[10]	CO2	L1
4	HDFC bank is facing with a problem of location for their new central processing facility, to process cheques from four existing branches of their main bank. Currently the cheques are being processed at the main bank only. The following data is made available to you. **Branch code / Location in co-ordinate distance from main bank (X, Y) / Volume of cheque transactions in (Thousands)** **A — 50 — 100 — 60** **B — 150 — 150 — 50** **C — 100 — 50 — 10** **D — 200 — 0 — 100** Given that the cost of transportation is Rs.100/1000 transaction per unit distance (I) Determine the location of central processing facility (CPF) using the simple median model, if the main bank wants to move all the volumes to the new CPF. (II) Graphically represent the location of the new CPF along with branch locations with respect to main bank. (III) Compute the annual Transportation cost.	[10]	CO3	L3
5	What do you understand by capacity, capacity planning process? Explain different types of capacity planning with examples.	[10]	CO1	L1
6	A manufacturer of tyres believes that their exists a linear relationship between automobiles sold in the year and the sales of the tyres two years later the data for the	[10]	CO4	L3

	past 10 years are given below. Establish a linear regression line; find what will be the sales of tyres given that the sale of automobiles was 6.1 lakhs also determine the correlation co-efficient.			

Sales of automobiles in lakhs	**4.0**	**4.5**	**4.2**	**5.5**	**5.8**	**5.5**	**6.2**	**7.2**	**6.7**	**7.9**
Sales of tyres 2 years later in lakhs	**8.0**	**7.9**	**8.1**	**8.4**	**8.1**	**8.6**	**9.1**	**8.9**	**9.1**	**9.6**

7	Forecast for 9th year using the following data by 3 yearly moving average and simple exponential smoothing technique with initial forecast being 85 and choosing smoothing constant as 0.5.Among the two which is the best method and why	[10]	CO4	L4

Year	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Demand in lakhs (Rs)	**90**	**100**	**107**	**113**	**123**	**136**	**144**	**155**

8a.	Differentiate between Delphi and nominal group qualitative forecasting techniques.	[5]	CO2	L2
8b.	(i) Identify common measure of capacity for the following systems: University, Restaurant, Steel mill, Airport, Bank (ii) Identify the type of layout due you prefer for manufacturing these products: Mobile phone, Television, Fast food restaurant, Car, Turbine	[5]	CO3	L1

SCHEME & SOLUTIONS FOR IAT-2 MAY 2017

SUB: OPERATIONS MANAGEMENT SEM: 8th SEM A&B

SUBCODE: 10ME81 ACADEMIC YEAR: 2016-17

① A Plant Layout is the systematic Arrangement of All physical Facilities In Such a Way to Achieve Fastest Throughput — 2 MARKS

DIFFERENT TYPES OF PLANT LAYOUT ALONG WITH EXPLANATION — (2×4 = 8 MARKS)

1. Product Type of plant Layout
2. Process Type of plant Layout
3. Fixed Position Type of plant Layout
4. Cellular Layout / Combination Type of P.L

② Total Demand = Final inventory + Expected Demand

= 50 + (3000 + 2000 + 2500)

⇒ 7550 UNITS — (1 MARK)

Total Capacity = Initial inventory + regular + overtime + Subcontract Capacity Limits

⇒ 100 + 2900(2) + 3000 + 500(2) + 400 + 300(3)

⇒ 11,200 UNITS — 1 MARK

Dummy / Fictious Demand = 11200 − 7550 ⇒ 3650 UNITS

Production Source	Demand Period 1	2	3	Final inventory	Dummy Demand	Production capacity
Initial Inventory	0 [100]	10	20	30	0	100
RP1	900	910	920	930	0 [2900]	2900
OT1	1000	1010	1020	1030	0 [500]	500
1 SC1	1300 [50]	1310	1320	1330	0 [250]	300
RP2	1000 [1000]	900 [2000]	910	920	0	3000
OT2	1100 [400]	1000	1010	1020	0	400
2 SC2	1400 [300]	1300	1310	1320	0	300
RP3	1100 [350]	1000	900 [2500]	910 [50]	0	2900
OT3	1200 [500]	1100	1000	1010	0	500
3 SC3	1500 [300]	1400	1300	1310	0	300
Forecasted Demand	3000	2000	2500	50	3650	11200 / 11200

Formulation of Aggregate planning Matrix - 5 MARKS

Total cost = $1300 \times 50 + 1000 \times 1000 + 900 + 2000 +$
$1100 + 400 + 1400 \times 300 + 1100 \times 350 + 900 \times 2500 +$
$910 \times 50 + 1200 \times 500 + 1500 \times 300$

= Rs 74,55,500

Final Solution - 3 MARKS

(3) Aggregate planning: Determines the resource capacity a firm will need to meet its demand over an intermediate time horizon - 6 to 12 months in the future, A.P provides a plan for allocating resources like Labor & Materials for production space & time for services.

- 2 Marks

A.P Costs

- 4 Marks

(1) Hiring & Layoff costs
(2) overtime & undertime costs
(3) Inventory carrying cost
(4) Subcontracting costs
(5) Back ordering costs
(6) Part time Labor costs

A.P strategies

- 4 Marks

(1) Vary the Workforce Size
(2) Vary the No. of Working hrs
(3) Vary the inventory levels
(4) Backordering
(5) Subcontracting
(6) Product promotion

④ Median = $\frac{60+50+10+100}{2}$ = 110 UNITS

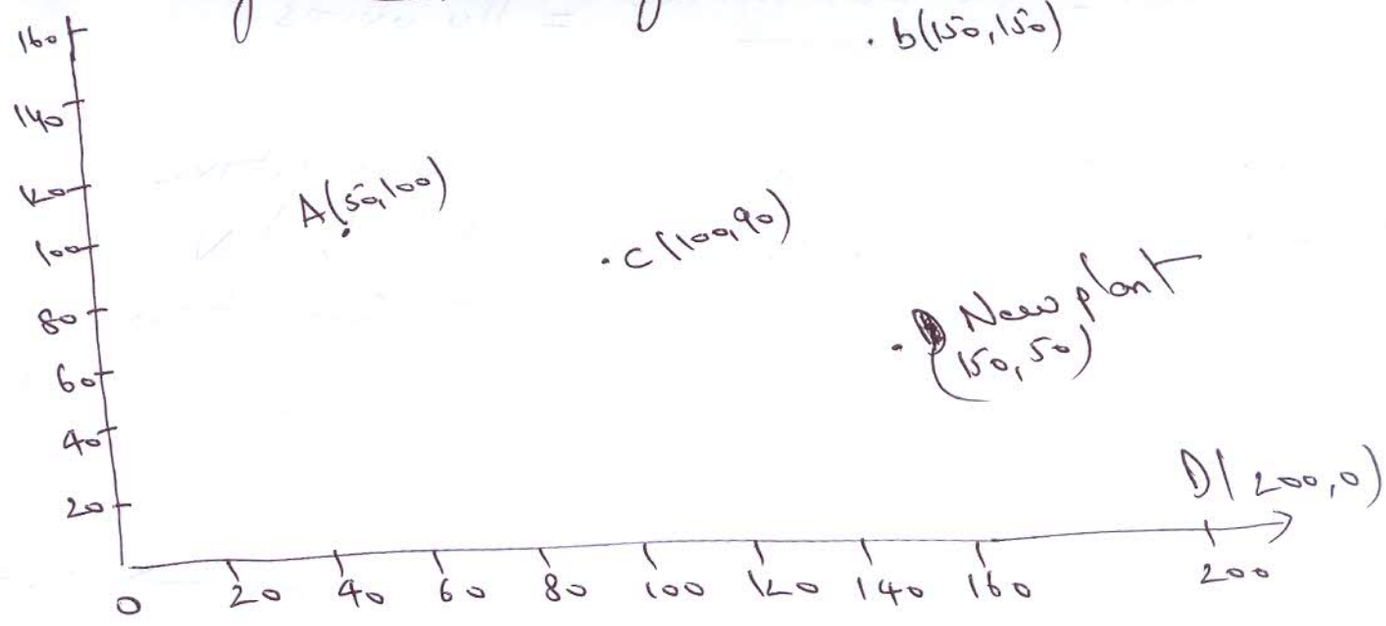
Co-ordinate of X in Ascending order	Vol. of ch/s	Cumulative Vol. of ch/n ← Transactions
A(50,100)	60	60
C(100,50)	10	70
B(150,150)	50	120 → $X_0 = 150$
D(200,0)	100	200

Co-ordinate of Y in Ascending order	Vol. of ch/s	Cumulative Vol. of ch/n ← Transactions
D(200,0)	100	100
C(100,50)	10	110 → $Y_0 = 50$
A(50,100)	60	170
b(150,150)	50	220

$\therefore (X_0, Y_0) = (150, 50)$ → New plant location.

(2+3) – 6 MARKS

Graphically Representing



—2 Marks

Annual Transportation Cost

Branch Code	$L_i = \lvert(x_0 - x_i)\rvert + \lvert(y_0 - y_i)\rvert$	Vol. of Jt P_i	Cost C_i	$P_i C_i L_i$ Annual Cost
A	$L_A = 150$	60	100	900000
B	$L_B = 100$	50	100	500000
C	$L_C = 50$	10	100	50000
D	$L_D = 100$	100	100	1000000

— TOTAL

$\Sigma P_i C_i L_i = 24,50,000$ //

—2 Marks.

(5)

Capacity is defined As the Maximum Level of Value added Activity over a period of time that the process Can be Achieved using Normal Process/Normal operating Conditions.

-2 MARKS.

Capacity planning process is Determining the Production Capacity Required by an organization to Meet the Changing Customer demands for its products is termed As Capacity planning process

-2 Marks.

TYPES OF CAPACITY PLANNING (3+3 Marks)

(1) Long Range Capacity planning : Period > 2 yrs

(2) Medium Range Capacity planning : Period 6 to 18 Months

(3) Short Range Capacity planning Period : < 6 Months

(1) Long Range examples are

a. Acquisition of Land
b. Construction of building
c. Capital expenditure
d. Mergers & Acquisitions
e. Introduction of New products/alteration
f. forecast growth in demand
g. future upgrading of Technology

(2) Medium range examples

a. Hiring / Laying off Workers
b. Purchasing of Minor Maintenance / Carry / Tools
c. Subcontracting / outsourcing.

(3) Short range examples

a. Meet Forecasted demands
b. Actual demand witnessed
c. Ability to Satisfy last demands
d. Reduce Prodn Costs
e. Improve Quality of Products & Services.

(5) $\Sigma x = 57.5$

$\Sigma y = 85.8$

$\Sigma x^2 = 345.61$

$\Sigma y^2 = 739.14$

$\Sigma xy = 499.36$

$S_{xx} = 14.985 \times 10^{10}$

$S_{yy} = 2.976 \times 10^{10}$

$S_{xy} = 6.01 \times 10^{10}$

$$b = \frac{S_{xy}}{S_{xx}} = 0.401$$

$$a = \bar{y} - b\bar{x}$$

$$a = \frac{85.8}{10} - (0.401)\left(\frac{57.5}{10}\right)$$

$$a = 6.27 \times 10^{5}$$

$y = a + bx$

$y = 6.27 \times 10^5 + 0.401x$ — 8 Marks

At $x = 6.1 \times 10^5$ $y = ?$

$y = 6.27 \times 10^5 + 0.401 (6.1 \times 10^5)$

$y = 8.71$ Lakhs — 1 Mark

Co-relation Coefficient $r = 89.91$. — 1 Mark

(7)

Year	Demand in Lakhs	3 PM	SES $F_t = \alpha(D_{t-1}) + (1-\alpha) F_{t-1}$
			85
2001	90		87.5
2002	100		93.75
2003	107	99	100.37
2004	113	106.66	106.68
2005	123	114.33	114.84
2006	136	124	125.42
2007	144	134.33	134.71
2008	155	145	144.85
2009			

3+3 = 6 Marks

Mean Squared Error For 3PMA = 351.72 – 2 Marks

MSE for SES = 248.61 – 2 Marks

Comparing both SES is the Best Technique

8a) Delphi Normal Qualitative forecasting Technique.
5 – differences
1+5 = 5 Marks

8b) (i) University – No of students → 0.5+5=2.5 Marks
Restaurant – No. of seats
Steel Mill – Tons of steel
Airport – No. of Runways
Bank – No. of Accounts

(ii) Mobile phone – cellular Layout 0.5+5=2.5 Marks
Television – Process Layout
Fast food Restaurant – Process Layout
Car – Combination / Process Layout
Turbine – Process Layout