CMR
INSTITUTE OF
TECHNOLOGY

Internal Test -II April 2018

Sub:	Operations Management				Code:	10ME81
Date:	16/ 04 / 18	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 Demand Forecasting? Briefly explain different types forecasting with their objectives and importance?	[10]	CO1	L1
2	The daily demand for chocolates at a shop is given below for a week period What is the forecast for the 8th day using trend adjusted exponential smoothing the values of F=90 , T=0 , $\alpha = \beta = 0.2$ Day: 1 | 2 | 3 | 4 | 5 | 6 | 7 Demand: 80 | 95 | 120 | 110 | 75 | 60 | 50	[10]	CO3	L3
3a	Explain components of time series forecasting?	[04]	CO2	L1
3b	What is a forecast error, mention the types of forecast controls? Explain the significance of MSE and tracking signal?	[06]	CO2	L1
4	Yes 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 tires 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 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.	[10]	CO4	L3

	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 **Year** 2001 2002 2003 2004 2005 2006 2007 2008 **Demand in lakhs (Rs)** 90 100 107 113 123 136 144 155											[10]	CO4	L4
8a.	Differentiate between Delphi and nominal group qualitative forecasting techniques.											[5]	CO2	L2
8b.	Identify common measure of capacity for the following systems: University, Restaurant, Steel mill, Airport, Bank, Brewery, movie theatre, Power plant, Automobile factory, sugar mill.											[5]	CO3	L1

II - IAT Solutions

1A) Demand forecasting is the estimation of likely sales demand for a particular future period

Importance:

- Majority of activities in industry depend on future sales.
- Demand forecasting is necessary to take decision on investment on men, machines, etc
- Forecasting is important for plant activities for full utilization of plant capacity
- Needed to throw light on future of market.

Objectives:

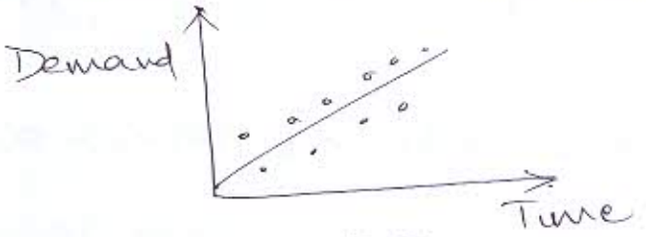
- To decide plant capacity
- Man power planning
- Long run production planning
- Financial requirement for long term
- Regular supply of raw materials
- Formulation of production schedules.

2A) given : $\alpha = \beta = 0.2$, $F = 90$, $T = 0$

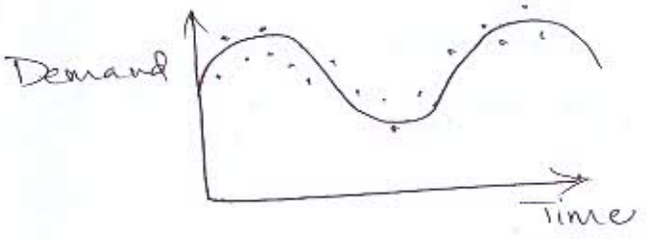
Day	Demand (A_t) (in 1000's)	$F_t = \alpha D_{t-1} + (1-\alpha) F_{t-1}$	$T_t = T_{t-1} + \beta(F_t - F_{t-1})$	$F_{ta} = F_t + T_t$
1	80	90	0	90
2	95	88	- 0.4	87.6
3	120	89.4	- 0.12	89.28
4	110	95.52	1.104	96.62
5	75	98.41	1.68	100.09
6	60	93.72	0.742	94.46
7	50	86.976	- 0.606	86.3
8	?	79.55	- 2.08	77.4

3A] a] Various components of time series:

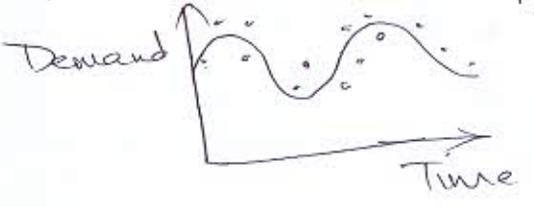
→ Trend [T] : long period tendency of a demand to increase is known as trend.



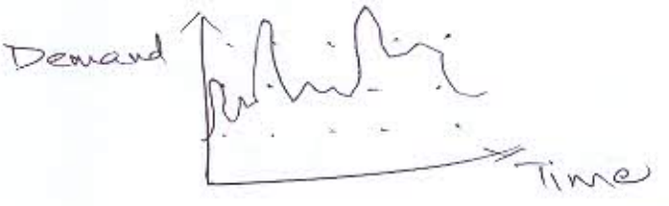
→ cyclic variation [C]: when demand fluctuates above & below a trend line it an oscillating pattern



→ Seasonal variation [S] : occurs when there is a similar demand pattern that occurs during corresponding months of successive years.



→ Irregular variation [R] : when demand fluctuation are wayward & occur for no reason, without a fixed pattern.



4A] Median load

$= 60 + 50 + 10 + 100$

$= 220$

$\therefore$ Median $= \frac{220}{2} = 110$

To find X-coordinate of new location.

Branch	Coordinates in increasing x-coordinate	load	Cumulative load
A	(50, 100)	60	60
C	(100, 50)	10	70
B	(150, 150)	50	120 ← Median
D	(200, 0)	100	220

$\therefore X_0 = 150$

To find Y-coordinate of new location

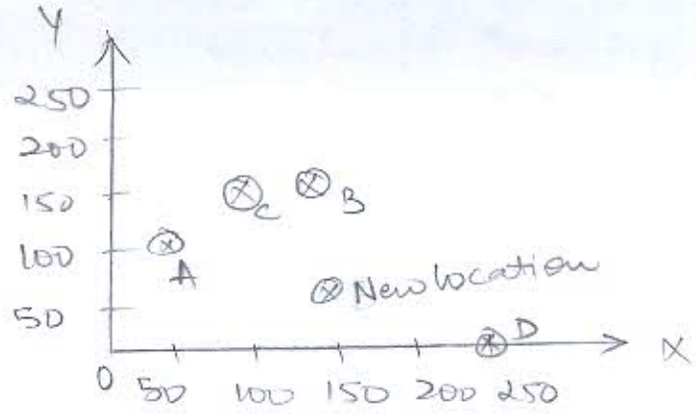
Branch	Coordinates in increasing y-coordinate	load	Cumulative load
D	(200, 0)	100	100
C	(100, 50)	10	110 ← Median
A	(50, 100)	60	170
B	(150, 150)	50	220

$\therefore Y_0 = 50$

Transaction cost

Branch	P_i	$L_i = \lvert X_0 - X_i \rvert + \lvert Y_0 - Y_i \rvert$	C_i	$L_i P_i C_i$
A	60	$L_1 = 150$	100	900000
B	50	$L_2 = 100$	100	500000
C	10	$L_3 = 50$	100	50000
D	100	$L_4 = 100$	100	1000000
				$\Sigma = 2450000$

$\therefore$ Optimal cost = Rs 2450000



5A] Capacity of an operation is defined as the max. level of value added activity over a period of time that the process can achieve under normal operating conditions

Capacity planning process is determining the production capacity required by an organization to meet the changing customers demands for its products.

Types of capacity planning:

i] Period > 2years

- Acquisition of land
- Capital expenditure
- Merges
- Introduction of new products
- Future upgrading of technology

ii] Medium range capacity planning : [6-18 months]

- Hiring / Layoffs of workers
- Purchasing of minor maintainance tools
- Subcontracting / make / buy decisions

iii] Short range capacity planning : [< 6months]

- To meet forecasted demand
- Ability to satisfy peak demand
- Improve quality of products

6A)

Sales of automobile [X]	Sales of tyre of that automobile later [Y]	X^2	Y^2	XY
4	8	16	64	32
4.5	7.9	20.25	62.41	35.55
4.2	8.1	17.64	65.61	34.02
5.5	8.4	30.25	70.56	46.2
5.8	8.1	33.64	65.61	46.98
5.5	8.6	30.25	73.96	47.3
6.2	9.1	38.44	82.81	56.42
7.2	8.9	51.84	79.21	64.32
6.7	9.6	44.89	92.16	75.84
7.9	9.6	62.41	92.16	
$\Sigma = 57.5$	$\Sigma = 86.3$	$\Sigma = 345.6$	$\Sigma = 748$	$\Sigma = 502$

$n = 10$

$$S_{xx} = \Sigma x^2 - \frac{(\Sigma x)^2}{n}$$

$$= 345.6 - \frac{(57.5)^2}{10}$$

$$= \underline{14.98}$$

$$S_{yy} = \Sigma y^2 - \frac{(\Sigma y)^2}{n}$$

$$= 748.4 - \frac{(86.3)^2}{10}$$

$$= \underline{3.63}$$

$$S_{xy} = \Sigma xy - \frac{\Sigma x \Sigma y}{n}$$

$$= 502.6 - \frac{(57.7 \times 86.3)}{10}$$

$$= \underline{6.435}$$

$$b = \frac{S_{xy}}{S_{xx}} = 0.43$$

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

$$\bar{x} = \frac{\Sigma x}{n} = 5.75$$

$$\bar{y} = \frac{\Sigma y}{n} = 8.63$$

$$a = 6.157$$

regression line

$$y = a + bx$$

$$y = 6.157 + 0.43x$$

for $x = 6.1$

$$y = 6.157 + (0.43 \times 6.1)$$

$$y = 8.78 \text{ lakhs}$$

7A] 3PMA

Year	A_t Demand	F_t [3PMA]	$E_t = A_t - F_t$	E_t^2
2001	90			
2002	100			
2003	107			196
2004	113	99	14	268.96
2005	123	106.6	16.4	470.89
2006	136	114.3	21.7	400
2007	144	124	20	429.24
2008	158	134.33	20.67	
2009	?	145		$\Sigma =$

MSE = 352.61

Simple Exponential Smoothing

Year	Demand (D_t)	$F_t = \alpha D_{t-1} + (1-\alpha) F_{t-1}$	E_t	E_t^2
2001	90	85	5	25
2002	100	87.5	12.5	156.25
2003	107	93.75	13.25	175.56
2004	113	100.37	12.63	159.51
2005	123	106.68	16.32	266.34
2006	136	114.84	21.16	447.74
2007	144	125.42	18.58	345.21
2008	155	134.71	20.29	411.68
2009	?	144.85		$\Sigma = 1987.2$

$MSE = 248.4$

We choose SES method as error is less

8A) a)

Delphi	Nominal group
• A panel of experts give solution	• Similar to delfi, a panel decide what to do
• A coordinator coordinates the discussion	• No coordinator is present
• The discussion is in writing	• The discussion is verbal
• There may / may not be room for creativity	• There is room for creativity

b)
- University, airport, movie theatre — No. of seats
- Steel mill — tonne of steel
- Restaurant — No. of tables
- Bank — no. of accounts
- Brewery — no of barrels
- Power plant — kWO of power generated
- Automobile factory — No. of cars produced
- Sugar mill — kilos of sugar