1. Write down the organizational hiercay level of any company (from website of that company and please mention the company name) and provide level of managers for that specific manufacturing or service (except University) company from Bangladesh?

After inspecting the website for the 'Infrastructure Development Company Limited' (IDCOL). (www.idcol.org/home/management)

1) Top level Managers
   - Executive Director and CEO
   - Deputy CEO and CFO

2) Senior / Upper-Mid-level Management
   - Chief Investment officers
   - Chief Risk officer
   - Head of Renewable Energy.

3) Lower-Middle-level Management
   - Senior Vice President
   - Unit Head
   - Assistant vice President

The number and roles of managerial positions vary from company to company. IDCOL provided the name and the holders of its management section inside their webpage. And thus the appropriate hierarchy was created from that data.

2. PRODUCTIVITY EXERCISE

Compute the multifactor productivity measure for each of the weeks shown. Assume 40 hrs in a week and an hourly wage $10. Overhead cost is 2.5 times to total weekly labor cost. Material cost is $5 per kg. Standard price is $80 per unit

Week	Output (Units)	Workers	Materials (Kg)
1	20,000	5	350
2	15,000	6	370
3	22,000	7	380

Also compute the productivity growth of week 3 in compare to week 1 of this problem.

Week-1 productivity measure = $\frac{20000 \times 80}{(5\times10\times40)+(2.5\times5\times10\times40)+(5\times350)}$

= 182.86 dollars per dollar input

Week-2 productivity measure = $\frac{15000 \times 80}{(6\times10\times40)+(2.5\times6\times10\times40)+(370\times5)}$

= 117.07 dollars per dollars input

Week-3 productivity measure = $\frac{22000 \times 80}{(7\times10\times40)+(2.5\times7\times10\times40)+(380\times5)}$

= 150.4273 dollars per dollar input

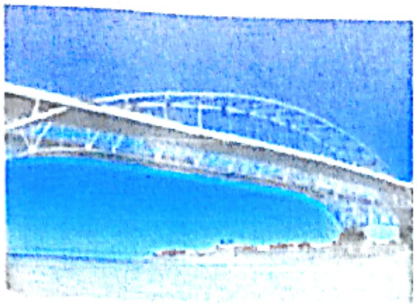
productivity growth of week-3 compared to week-1 = $\left(\frac{150.43 - 182.86}{182.86} \times 100\right)\%$

= -17.73 % (Ans)

3. BLUE-WATER BRIDGE FORECSTING

The Blue Water Bridge spans the Saint Clair River, and carries international traffic between Port Huron, Michigan and Point Edward and Sarnia, Ontario. Located near interchange of I-94 and I-69, the bridge forms a critical gateway linking Canada and the United States.

To forecast eastbound and westbound monthly truck volume of blue water bridge from 1985 march to 1986 march they applied simple exponential smoothing and linear trend.



Westbound and eastbound truck volume data from Jan 1984 to Feb 1985 by each month.

Month	Westbound	Eastbound
January' 84	13253	12969
February' 84	12978	12689
March' 84	14716	14444
April' 84	14196	13920
May' 84	15699	15596
June' 84	15619	15323
July' 84	13799	13448
August' 84	14612	14539
September' 84	14411	14165
October' 84	16232	15964
November' 84	15603	15309
December' 84	13525	13177
January' 85	15706	15513
February' 85	14125	14250

3. (A) Find forecast for January 84 to march 85 for Westbound using Three period moving average.

   (B) Find forecast forJanuary 84 to march 85 for Eastbound using EST with $\alpha = 0.7$

USE EXTRA PAGE TO SOLVE THESE PROBLEMS

(P.T.O)

A) 3-point moving average

Month	Westbound	Three-point moving average
January '84	13253	—
February '84	12878	—
March '84	14716	—
April '84	14186	$(13253+12878+14716)/3 = 13615.66$
May '84	15699	$(14186+14716+12878)/3 = 13926.67$
June '84	15619	$\frac{(15699+14186+14716)}{3} = 14867$
July '84	13799	$\frac{(15619+15699+14186)}{3} = 15167$
August '84	14612	$\frac{13799+15619+15699}{3} = 15039$
September '84	14411	$\frac{14612+13799+15619}{3} = 14676.67$
October '84	16232	$\frac{14411+14612+13799}{3} = 14274$
November '84	15603	$\frac{16232+14411+14612}{3} = 15085$
December '84	13525	$\frac{15603+16232+14411}{3} = 15415$
January '85	15706	$\frac{13525+15603+16232}{3} = 15120$
February '85	14125	$\frac{15706+13525+15603}{3} = 14944.67$
March '85	—	$\frac{14125+15706+13525}{3} = 14452$

B) Exponential Smoothing with smoothing constant, $\alpha = 0.7$

Month	Eastbound	Exponential Smoothing ($F_t = F_t + (A_t - F_t)\alpha$
January '84	12968	–
February '84	12689	12968
March '84	14444	12772.7
April '84	13820	13912.61
May '84	15596	13856.783
June '84	15323	15074.23
July '84	13448	15248.37
August '84	14539	13988.11
September '84	14165	14373.73
October '84	15964	14227.62
November '84	15308	15143.09
December '84	13177	15318.53
January '85	15513	13823.457
February '85	14250	15007.6373
March '85	–	14477.29

Assignment - 1:

With an average output of 80 carts per hour, workers receive $10 per hour, and machines cost was $40 per hour. With the new equipment, it is possible to transfer one worker to another department while equipment cost is increased by $10 per hour while output is increased by 4 carts per hour.

a) Labor productivity before and after? Unit in carts per workers per hours.

b) Multifactor productivity for each system. Unit is carts per dollars cost

c) Comment on the change of systems. Which one is more pertinent for the situation.

a) Ans: Labor productivity (before) = $\frac{80}{5} = 16$ carts per worker per hour

Labor productivity (after) = $\frac{84}{4} = 21$ carts per workers per hour (Ans)

b) Ans: before = $\frac{80}{(5\times10)+40} = 0.88$ carts per dollars cost

After = $\frac{84}{(4\times10)+50} = 0.93$ carts per dollar cost. (Ans)

(c) The new system is more useful as the overall productivity increases. The transffermed workers can work of a different sector, increasing secondary productivity. (Ans)

2)

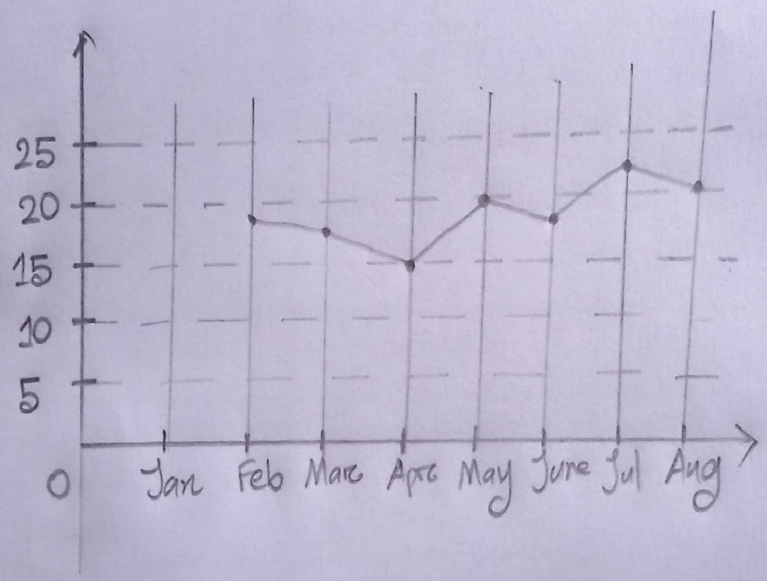
Month	Sales
Feb	19
March	18
April	15
May	20
Jun	18
July	22
Aug	20

a) Plot the monthly data.

b) Forecast September sales using

- → Naive approach
- → five-month moving average
- → weighted average using 0.6 for Aug, 0.3 for July & 0.1 for June
- → EST with 0.2 smoothing constant assumming March forecast of 19(00)
- → Linear Trend Eqn.

a)



b) Naive Approach:

Month	Sales	Naive
Feb	19	-
March	18	19
April	15	18
May	20	15
Jun	18	20
July	22	18
Aug	20	22
Sep	-	20

(c) five point moving average:

$$F_{Sept} = \frac{20+22+18+20+15}{5} = 19 \quad (Ans)$$

(d) Weighted moving average: $= \frac{(0.6\times 20)+(0.3\times 22)+(0.1\times 18)}{0.6+0.3+0.1}$

$= 20.4$ Ans)

(e) $\alpha = 0.2$

x ↓	Month (x)	Sales (y) (000)	Exponential Smoothing	xy	x^2
1	Feb	19	-	19	1
2	March	18	19	36	4
3	April	15	18.8	45	9
4	May	20	18.04	80	16
5	June	18	18.432	90	25
6	July	22	18.3456	132	36
7	August	20	19.0765	140	49
8	Sept	-	19.26		
$\Sigma x = 28$		$\Sigma y = 132$	(Ans)	$\Sigma xy = 542$	$\Sigma x^2 = 140$

(f) $$b = \frac{n\Sigma xy - \Sigma x \Sigma y}{n\Sigma x^2 - (\Sigma x)^2} = \frac{(7\times 542) - (28\times 132)}{7\times 140 - (28)^2}$$

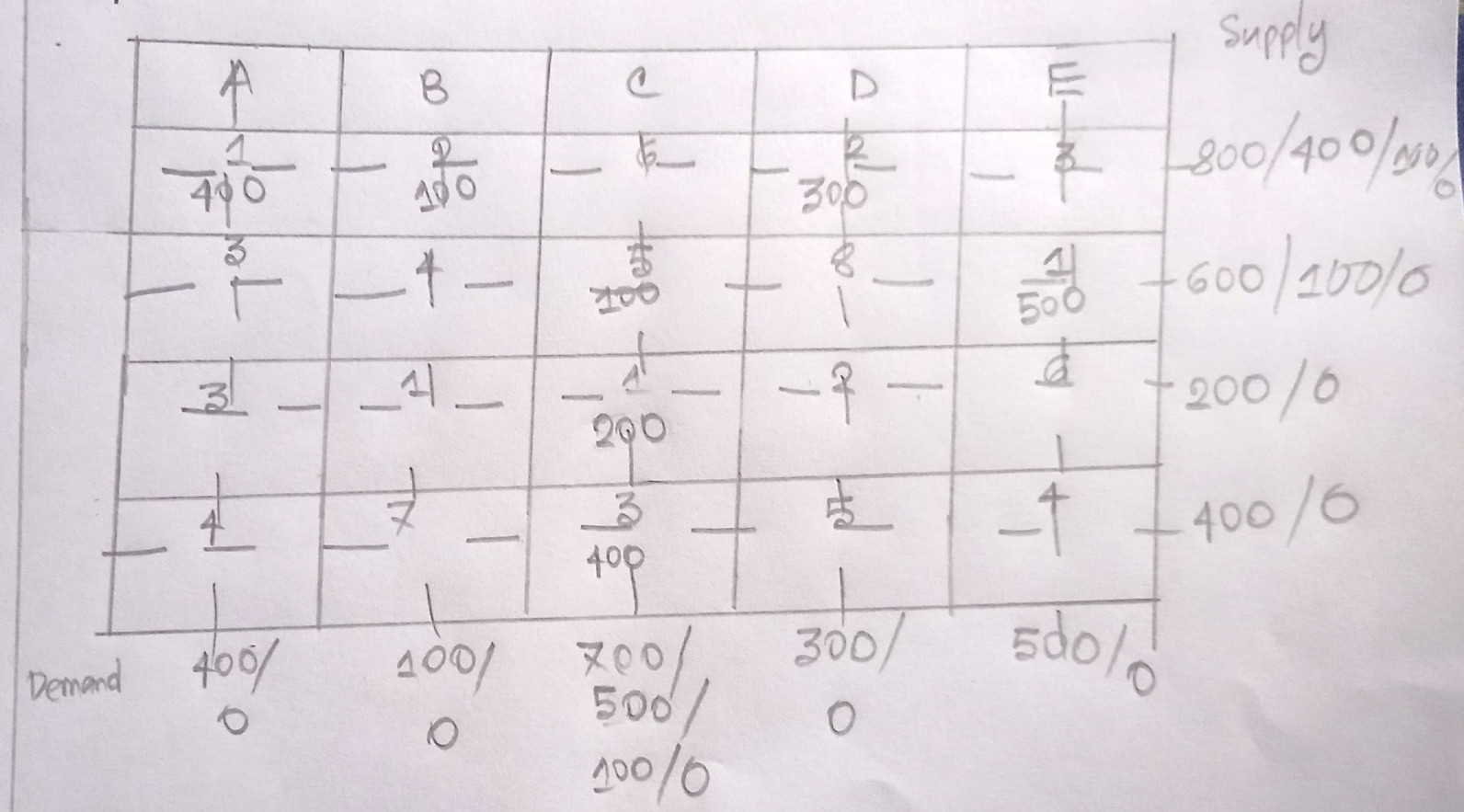
$$= \frac{98}{196} = 0.5$$

$$a = \frac{\Sigma y - b\Sigma x}{n} = \frac{132 - (0.5\times 28)}{7} = 16.85$$

$\therefore y = a + bx = 16.85 + 0.5x$ (Ans)

$y_8 = y_{sept} = 16.85 + 0.5\times 8 = 20.85$

Assignment -3: four factories which supply warehouses A, B, C, D and E. Monthly factory capacities are 800, 1600, 200 & 400. Monthly warehouse requirements are 400, 100, 700, 300 and 500. Unit shipping costs in tk.



least cost = (1×400) + (2×100) + (2×300) + (5×100) + (1×200) + (3×400) + (1×500)

= 400 + 200 + 600 + 500 + 200 + 1200 + 500

= 3600 tk

Ans