VIT
Vellore Institute of Technology

Final Assessment Test – November 2019

Course: MEE1014 - Industrial Engineering and Management
Slot: E2+TE2
Class NBR(s): 1657
Time: Three Hours
Max. Marks: 100

KEEPING MOBILE PHONE/SMART WATCH, EVEN IN 'OFF' POSITION, IS EXAM MALPRACTICE

General Instruction: Statistical Log Book Permitted

Answer any FIVE Questions

(5 X 20= 100 Marks)

1. a) A gardener wants to develop a forecast for next year's quarterly sales of cactus trees. He has collected quarterly sales for the past two years and expects total sales for next year to be 500 cactus trees. The data clearly exhibit seasonality. How much can he expect to sell during each quarter of next year accounting for seasonality? [10]

	Cactus Trees Sold	
Season (quarter)	Year 1	Year 2
Fall	100	110
Winter	82	95
Spring	180	173
Summer	110	110

b) A cosmetics company uses exponential smoothing with trend to forecast monthly sales of its special face cream. At the end of November, the company wants to forecast sales for December. The trend through October has been 10 additional boxes sold per month. Average sales have been 60 boxes per month. The demand for November was 68 boxes. The company uses $\alpha = 0.20$ and $\beta = 0.10$. [10]

a) Find a forecast including trend for the month of December.

b) If the demand for December was 70 boxes, find forecast including trend for the month of January next year.

2. a) A company specialise in the manufacture of small capacity motor. The cost structure of one motor is as under [10]

Material cost=Rs 50
Labour cost = Rs 80
Variable overhead = 75% of labour cost.
Fixed costs of the company amount to Rs.2,40,000/year.
The sales price of the motor is Rs.230 each.

i. Determine the number of motors to be manufactured to break even.
ii. How many motors are to be sold to make a profit of Rs.100000/year.
iii. If the sales price is reduced by Rs.15, how many motors are to be sold to break even.

b) Long Beach Bank employs three loan officers, each working eight hours per day. Each officer processes an average of five loans per day. The bank's payroll cost for the officers is $820 per day, and there is a daily overhead expense of $500. The bank has just purchased new computer software that should enable each officer to process eight loans per day, although the overhead expense will increase to $550. Evaluate the change in labor and multifactor productivity before and after implementation of the new computer software. [10]

3. a) It is needed that you have to visit a bank to withdraw money from the ATM (adjacent to bank) and make one demand draft (DD) of Rs. 5000/- which is the registration charges for attending one important workshop at IIT Bombay. After making the DD you have to courier it to IIT Bombay. Starting from your residence list all the activities needed to complete the above tasks and again you have to return back to your residence. Develop a suitable flow process chart to demonstrate the above activities. In the chart mention the duration required for the activities. [10]

b) A company has collected the following details to develop a standard time for manufacturing their product. All of the times are in minutes. [10]

Observations	Elements					
	1	2	3	4	5	6
Cycle 1	1.10	3.00	0.92	1.23	1.46	1.80
Cycle 2	1.08		0.88	1.30	1.64	1.78
Cycle 3	1.15	3.20	0.85	1.26	1.55	1.76
Cycle 4	1.16		0.88	1.33	1.52	1.80
Cycle 5	1.07	3.10	0.90	1.28	1.62	1.82
Cycle 6	1.10		0.94	1.30	1.60	1.82
Rating Factor:	0.90	1.0	1.10	1.0	1.0	1.10
Frequency:	1.0	0.5	1.0	1.0	1.0	1.0

(i) Find the mean observed time for each element.

(ii) Find the normal time for each element.

(iii) Using an allowance factor of 17 percent of individual job time, find the standard time for each element. Calculate the standard time for completing one unit of the product.

4. A firm wants to construct a new factory. The following information is provided. [20]

i) Number of departments in the layout = 7

ii) Area of departments:

Department	Function	Area (sq. m)
1	Receiving	12000
2	Milling	8000
3	Press	6000
4	Screw machine	12000
5	Assembly	8000
6	Painting	12000
7	Shipping	12000

iii) The REL-chart

From\To	1	2	3	4	5	6	7
1	--	E	O	I	O	U	U
2	E	--	U	E	I	I	U
3	O	U	--	U	U	O	U
4	I	E	U	--	I	U	U
5	O	I	U	I	--	A	I
6	U	I	O	U	A	--	E
7	U	U	U	U	I	E	--

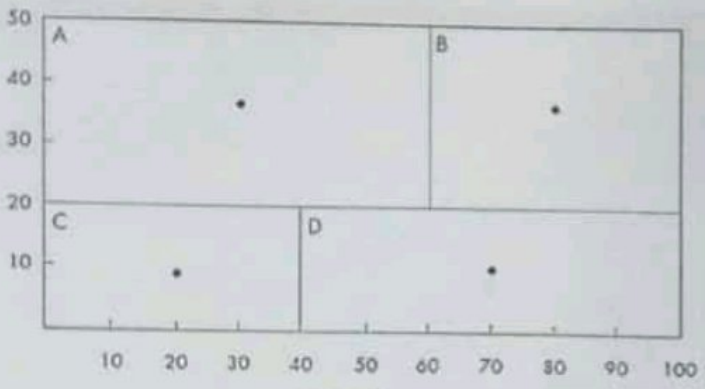
iv) Minimum department preference (MDP) value = I = 4.

v) Sweep width = 2.

vi) Number of iterations to be performed = 2 (= N).

Apply ALDEP algorithm to design a suitable layout. In the first iteration put department 5 first, and in the second iteration put department 4 first. Find the layout scores and comment which one is better.

5. A local manufacturing firm has recently completed construction of a new wing of an existing building to house four departments: A, B, C and D. The wing is 100 feet by 50 feet. The initial layout and flow matrix is given in below. Improve the initial layout using CRAFT algorithm. Assume unit cost matrix of transportation. (one iteration is sufficient). [20]



Initial Layout

From / To	A	B	C	D
A	-	3	5	4
B	2	-	4	6
C	5	2	-	3
D	6	3	3	-

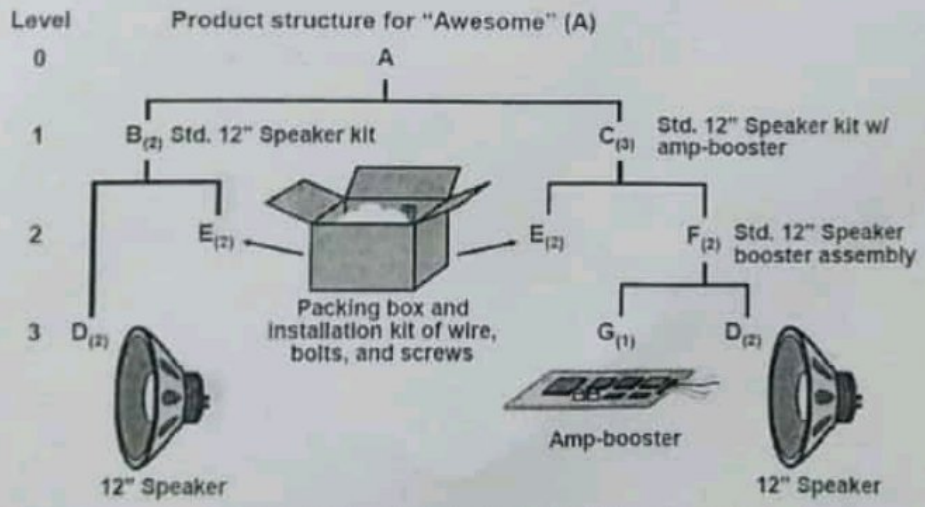
Flow matrix

6. a) For the following machine-component incidence matrix, obtain the final machine-component cells using Rank Order Clustering algorithm: **[10]**

Machine \ Component	1	2	3	4	5
1	0	1	0	1	0
2	1	0	0	0	1
3	0	1	1	0	0
4	1	0	0	0	1
5	0	0	1	1	0
6	0	0	0	0	1
7	0	1	1	1	0

Machine-Component Incidence Matrix

b) Consider the following product structure for the product A (Awesome): **[10]**



The factory wants to make 100 units of product A. Find the number of Bs, Cs, Ds, Es, Fs and Gs required to complete the job.

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