VIT
Vellore Institute of Technology

# Final Assessment Test – November 2019

Course: MEE1014 - Industrial Engineering and Management
Class NBR(s): 1655 Slot: D1+TD1
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 company make one type of executive chair. In one month the company manufactures 600 chairs and the selling price is fixed at $250 per unit. Assume that you have reviewed a company's income statement and classified each of its monthly expenses as either fixed or variable. This is the classification you prepared: [10]

| Fixed Costs/Month | | Variable Costs/Month | |
|---|---|---|---|
| Building rent | $10.000 | Direct materials (wood, varnish, etc.) | $28.800 |
| Property tax | 4.000 | Direct labor | 26.400 |
| Utilities | 900 | Overtime labor | 1.500 |
| Telephone | 850 | Billing costs | 2.000 |
| Depreciation | 8.000 | General maintenance | 1.300 |
| Insurance | 500 | | |
| Advertising | 3.000 | | |
| General office salaries | 7.000 | | |
| General maintenance | 700 | | |
| TOTAL | $34.950 | TOTAL | $60.000 |

i) Determine the break-even point.
ii) What will be the break-even point if the company decides to lower the price of chair to $225/unit?
iii) Assume that the actual fixed maintenance cost is $2,000 i.e. all maintenance costs are fixed. What is the break-even point?

b) A company uses exponential smoothing with trend to forecast monthly sales of its product, which show a trend pattern. At the end of week 5, the company wants to forecast sales for week 6. The trend through week 4 has been 20 additional cases sold per week. Average sales have been 85 cases per week. The demand for week 5 was 90 cases. The company uses $\alpha = 0.20$ and $\beta = 0.10$. Make a forecast including trend for week 6. If $\alpha = 0.8$ will the forecast be stable? Explain. [10]

2. a) A company is manufacturing washing machines establishes a fact that there is a relationship between sale of washing machine and population of the city. The market research carried out reveals the following information: [10]

| Population (Million) | 5 | 7 | 15 | 22 | 27 | 36 | 40 | 45 |
|---|---|---|---|---|---|---|---|---|
| No. of washing machines demanded (000s) | 28 | 40 | 65 | 80 | 96 | 130 | 142 | 150 |

Fit a linear regression equation for the above. Estimate the demand for washing machine if the city has population of 50 million and 90 million.

b) You are asked to visit a company which makes automobile spares for transport trucks. Suggest ways by which you can improve the worker productivity including ergonomic considerations. With numerical example show that an increase in production does not necessarily mean increase in productivity. [10]

3. a) Mr. Davis has to get his Royal Enfield bike serviced from authorized service station. Make a complete list of activities as standard procedure to complete the job. Demonstrate the entire job in a flow process chart. In the chart include the duration of the activities. [10]

b) There are five work elements to complete a job. The following information is provided: [10]

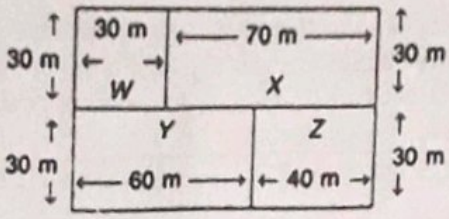
| Element | Mean Observed Time (minutes) | Performance Rating Factor | Frequency |
|---|---|---|---|
| 1 | 0.96 | 1.00 | 1.0 |
| 2 | 1.42 | 1.10 | 1.0 |
| 3 | 3.30 | 1.00 | 1.0 |
| 4 | 1.22 | 0.90 | 1.0 |
| 5 | 1.15 | 1.05 | 1.0 |

a) Calculate the normal time for each element.

b) If the company uses 18 percent allowance factor based on time worked, calculate the standard time for each element.

c) Calculate the standard hourly output. Calculate the expected hourly output at 120 percent of standard.

4. The ABC Ltd, has the present layout of its work departments as shown in Figure. Given the flow summary showing frequency of interdepartmental flow of materials and unit cost matrix, obtain the improved layout using CRAFT algorithm (one iteration required).




Flow Matrix:

| From /To | W | X | Y | Z |
|---|---|---|---|---|
| W | -- | 2 | 1 | 3 |
| X | 1 | -- | 1 | 2 |
| Y | 0 | 2 | -- | 2 |
| Z | 3 | 1 | 2 | -- |

Cost Matrix:

| From /To | W | X | Y | Z |
|---|---|---|---|---|
| W | -- | 1 | 1 | 1 |
| X | 1 | -- | 1 | 1 |
| Y | 1 | 1 | -- | 1 |
| Z | 1 | 1 | 1 | -- |

5. a) With the help of a suitable diagram discuss the Materials Requirement Plan processor demonstrating the various inputs and outputs. **[10]**

b) The list of parts needed to manufacture one unit of end-item P is shown as follows- **[10]**

P: 2As, 3Bs, 3Cs
A: 5Ms, 2Rs
B: 1D, 3Ns
C: 1T, 4Ns
M: 1N

a) Construct the product structure tree.

b) Find out the number of Ns that will be needed to manufacture 100Ps in each of the following situations-

i) There are presently 10Ps on hand.

ii) On-hand inventory consists of 15Ps, 10As, 20Bs, 10Cs, 100Ns, 300Ts and 200Ms.

6. a) What important reasons you should consider while locating the following: **[10]**

i) Integrated Steel Plant
ii) Thermal Power Plant
iii) National Research Centre
iv) Multi-cuisine Restaurant
v) Diary Product Factory

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

| | | Component j | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Machine i | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 |
| | 2 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| | 3 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| | 4 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| | 5 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| | 6 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| | 7 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |

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