



**FACULTY OF MECHANICAL ENGINEERING  
MID-SEMESTER EXAMINATION**

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|-------------------------|----------|--|
| <b>COURSE</b>           | <b>:</b> | <b>PRODUCTION PLANNING AND CONTROL</b> |
| <b>COURSE CODE</b>      | <b>:</b> | <b>BMM4823</b>                         |
| <b>LECTURER</b>         | <b>:</b> | <b>AHMAD NASSER MOHD ROSE</b>          |
| <b>DATE</b>             | <b>:</b> | <b>30 MARCH 2017</b>                   |
| <b>DURATION</b>         | <b>:</b> | <b>2 HOURS</b>                         |
| <b>SESSION/SEMESTER</b> | <b>:</b> | <b>SESSION 2016/2017 SEMESTER II</b>   |
| <b>PROGRAMME CODE</b>   | <b>:</b> | <b>BMM</b>                             |

**INSTRUCTIONS TO CANDIDATE:**

1. This examination paper consists of **TWO** questions. Answer **ALL** questions.
2. All answers to a new question should start on a new page.
3. All calculations and assumptions must be clearly stated.
4. Candidates are not allowed to bring any material other than those allowed by the invigilator into the examination room.
5. The question should be answered in English.

**EXAMINATION REQUIREMENTS:**

Table of formulae

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**DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO**

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This examination paper consists of **FIVE (5)** printed pages including the front page

**QUESTION 1 [30 Marks]**

- a) Describe how Delphi method could be applied for new product sales projection on;
- Drinking water or;
  - Self service laundry centre

(5 Marks)

- b) Pekan Post Office experiences a seasonal pattern of daily mail volume every week. **Table Q1a** shows the data for two representative weeks, expresses in thousands of pieces of mail.

**Table Q1a** Volume of mail (1000)

| Day       | Week 1 | Week 2 | Week 3 |
|-----------|--------|--------|--------|
| Sunday    | 5      | 8      | 15     |
| Monday    | 20     | 15     | 15     |
| Tuesday   | 30     | 32     | 36     |
| Wednesday | 35     | 30     | 28     |
| Thursday  | 49     | 45     | 40     |
| Friday    | 70     | 70     | 70     |
| Saturday  | 15     | 10     | 10     |
| Total     | 224    | 210    | 214    |

- Calculate a seasonal factor for each day of the week. (4 Marks)
  - If the postmaster estimates 230,000 pieces of mail to be sorted next week, forecast the volume for each day of the week. (10 Marks)
- c) Currently, Pekan Pos Laju department has received an increasing number of customers in the last 5 months. Therefore, as to ensure the department is able to fulfil the customer charter on service speed, the Planning Manager asking you to forecast for the next month. Based on previous data, the sales department decided  $\alpha$  is 0.2 and  $\beta$  0.5 with initial forecast for the 1<sup>st</sup> month is 41. **Table Q2b** shows the last data on number of customer that deal with courier service. Assume the initial forecast for the last month was 11 units and the trend over that period was 3 units.
- Compute the forecast sales for month 6. (6 Marks)
  - Comment the forecasting errors by using Mean Absolute Deviation. (5 Marks)

**Table Q2b** Previous data customer

| Month | No of customer |
|-------|----------------|
| 1     | 45             |
| 2     | 50             |
| 3     | 52             |
| 4     | 56             |
| 5     | 58             |
| 6     | ?              |

**QUESTION 2[30 Marks]**

- a) Briefly discuss how sales and operation planning could assist manufacturing companies to make a production plan. (5 Marks)
- b) The Meera Jati has projected the demand for their dining room table as in **Table Q2a**. Assume 4 weeks per month. All production information as highlighted in **Table Q2b** and **Table Q2c**. As a production planner, you are required to calculate the additional cost involve in three different strategies.
- i) Compute the extra cost to meet all demand by using level strategy of 760 units per month. You are allowed to use hiring, firing and overtime. Shortages are not allowed. (10 Marks)
- ii) Compare the extra cost in c (i) and (ii) with the cost of using hiring or firing and subcontracting, with no overtime and inventory. (10 Marks)
- iii) Propose three actions for further improvement in cost performance. (5 Marks)

**Table Q2a:** The demand for 6 month

| Month | Demand |
|-------|--------|
| 1     | 740    |
| 2     | 720    |
| 3     | 860    |
| 4     | 900    |
| 5     | 810    |
| 6     | 700    |

**Table Q2b:** Production capability and additional cost

|  |                              |
|--|------------------------------|
| Current employees                      | 20 workers                   |
| Production per employee (regular time) | 10 tables per week           |
| Overtime                               | 2 tables per worker per week |
| Overtime                               | Additional RM40 per table    |
| Subcontracting                         | Additional RM50 per table    |
| Hiring cost                            | RM2000 per worker            |
| Firing cost                            | RM3000 per worker            |
| Holding cost                           | RM10 per table per month     |

**END OF EXAMINATION PAPER**

Exponential smoothing

$$F_t = F_{t-1} + \alpha(A_{t-1} - F_{t-1})$$

Forecasting Errors

$$\text{MAD} = \frac{\sum |\text{Actual} - \text{Forecast}|}{n}$$

$$\text{MAPE} = \frac{\sum_{i=1}^n 100|\text{Actual}_i - \text{Forecast}_i|/\text{Actual}_i}{n}$$

$$\text{MSE} = \frac{\sum (\text{Forecast Errors})^2}{n}$$

Adjusted Exponential Smoothing

$$F_t = \alpha(A_{t-1}) + (1 - \alpha)(F_{t-1} + T_{t-1})$$

$$T_t = \beta(F_t - F_{t-1}) + (1 - \beta)T_{t-1}$$

$$\text{FIT}_t = F_t + T_t$$

Least squares method

$$y = a + bx \qquad b = \frac{\sum xy - n\bar{x}\bar{y}}{\sum x^2 - n\bar{x}^2}$$

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

Correlation coefficient

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Inventory Management

$$2DS = Q^2H$$

$$Q^2 = 2DS/H$$

$$Q^* = \sqrt{2DS/H}$$