FACULTY OF MECHANICAL ENGINEERING
FINAL EXAMINATION

COURSE	**:**	**PRODUCTION PLANNING AND CONTROL**
COURSE CODE	**:**	**BMM4823**
LECTURER	**:**	**AHMAD NASSER MOHD ROSE**
DATE	**:**	**15 JAN 2015**
DURATION	**:**	**2 HOURS AND 30 MINUTES**
SESSION/SEMESTER	**:**	**SESSION 2014/2015 SEMESTER I**
PROGRAMME CODE	**:**	**BMM**

INSTRUCTIONS TO CANDIDATE:

1. This examination paper consists of **FOUR (4)** 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.

EXAMINATION REQUIREMENTS:

NIL

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

This examination paper consists of **SIX (6)** printed pages including the front page.

QUESTION 1 [25 Marks]

Always One Sdn. Bhd. is a manufacturer of car's battery would like to expand their production line for the production of 2015. However, the expansion is subjected to the demand capacity whether it will be increased or decreased in year 2015. **Table Q1** shows the previous demand for last 5 years. As an expert in this field, you are required to help Always One to solve few questions as highlighted below;

Table Q1 Demand for the year 2010 to 2014

Year	Demand
2010	120
2011	140
2012	160
2013	190
2014	200
2015	?

a) Develop a forecasting model by using linear regression. **(12 Marks)**

b) Determine the forecasting demand for the year of 2015. **(3 Marks)**

c) Do you think the company should expand the plant for the production of year 2015? Your answer should be justified. **(5 Marks)**

d) Analyse the forecasting error by using Mean Square Error (MSE). **(5 Marks)**

QUESTION 2 [25 Marks]

Cukai Sdn Bhd is a manufacturer of fish junk food has developed a monthly forecast for their product. Data from January to April are presented in **Table Q2a**. The company would like to anlyse three strategies of aggregate plan as highlighted in **Table Q2b**. Details of cost information as in **Table Q2c**. As a responsible production planner, which plan do you recommend and why that plan is chosen?

Table Q2a : Production demand from January to April

Month	Demand
January	25000
February	50000
March	35000
April	60000

Table Q2b Plan strategies

Plan	Strategy
1	Level strategy with constant workforce
2	Level strategy with constant workforce of 42000 and remaining support with sub-contract and overtime
3	Chase strategy

Table Q2c Additional information

Beginning Workforce	120 workers
Production per Employee	250 units per month
Hiring Cost	RM1000 per worker
Firing Cost	RM1500 per worker
Inventory Carrying Cost	RM15 per unit per month
Production cost per unit	RM3
Overtime with maximum capacity of 400 units per month	RM5 per unit
Subcontracting with maximum capacity of 100 units per month	RM10 per unit

QUESTION 3 [25 Marks]

Soho Printing Sdn. Bhd. is a company specialises in card designing and printing. Due to school holiday, the demand of wedding cards is suddenly increased, you are as the production planner has to schedule which job is treated priority as to meet the customer orders. **Table Q3a** shows the recent orders for the last week. Each order is represented by Purchase Order (PO) codes.

i. Complete the **Table Q3b** below and determine in what sequence would the jobs be ranked according to FCFS, SPT, LPT, and EDD rules. All calculation should be shown in the answer booklet. **(20 Marks)**

ii. Based from the above scheduling, analyse individually, which dispatching rules has the best score for flow time, utilization, and lateness. **(5 Marks)**

Table Q3a

PO code	*Date Job Received*	*Job work processing (Day)*	*Job Due Date (Days)*
Husna-011	12/01/15	6	8
Ezzie-013	13/01/15	2	6
Lai-014	14/01/15	8	18
Azim-015	15/01/15	9	23
Yoga-016	16/01/15	3	15

Table Q3b

Rule	*Job Sequence*	*Flow Time*	*Utilisation*	*Average Number of Jobs*	*Average Lateness*
FCFS					
SPT					
LPT					
EDD					

QUESTION 4 [25 Marks]

Geliga Machine Shop was forecasted 2600 brackets will be used in this year. Total working day for this year is 260 days. These brackets were purchased lot by lot from a supplier in Bangi Industrial Estate. **Table Q4** shows the bracket ordering information. You are required to assists Geliga Machine Shop on inventory management as highlighted below;

Table Q4 : Additional information on bracket

Annual demand	2500 units
Holding cost per bracket per year	RM1.50
Ordering cost per order	RM18.75
Lead time	3 days
Price per bracket	RM5/unit

a) Determine the Economic Order Quantity (EOQ) for Geliga Machine Shop . **(5 Marks)**

b) Compute the total cost including the cost of bracket **(5 Marks)**

c) When should Geliga Machine shop make an order as to avoid bracket stock out **(5 Marks)**

d) Should Geliga Machine shop accept the offer of 3% discount if minimum order is 400 brackets? **(5 Marks)**

e) Briefly describe available techniques to operations managers to deal with bottleneck operation. **(5 Marks)**

END OF EXAMINATION PAPER

FORMULAE

Exponential smoothing

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

Forecasting Errors

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

$$\text{MAPE} = \frac{\sum_{i=1}^{n} 100|\text{Actual}_i - \text{Forecast}_i|/\text{Actual}_i}{n} \qquad \text{MSE} = \frac{\Sigma (\text{Forecast Errors})^2}{n}$$

Adjusted Exponential Smoothing

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

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

$$FIT_t = F_t + T_t$$

Least squares method

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

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

Correlation coeficient

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

Inventory Management

$$2DS = Q^2H$$

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

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