

LOCATION: SWANSEA

LLEOLIAD: ABERTAWE

LEVEL 5

LEFEL 5

**EXAMINATION PERIOD
MAY 2019**

**CYFNOD ARHOLIADAU
2019**

**MODULE CODE:
M5X01176**

TIME: 2 HOURS

ALL CANDIDATES TO ANSWER QUESTION 1 IN SECTION A

**ALL BENG MECHANICAL, MECHANICAL & MANUFACTURING AND
EXTREME SPORTS CANDIDATES TO ANSWER ANY TWO
QUESTIONS FROM SECTION B (ANDREW THORN)**

**ALL BENG MOTORSPORT, MOTORCYCLE, AND AUTOMOTIVE
ENGINEERING CANDIDATES TO ANSWER ANY TWO QUESTIONS
FORM SECTION C (MARK SANDFORD)**

*Equipment or materials required – Calculators may be used
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Section A

Question 1

Down to Earth is an innovative energy company that produce specialist light sensors. The firm has fixed costs of £500,000 per annum. Variable costs are £7 per unit and the firm can produce 60,000 units per annum. The finished product sells for £20 per unit.

- a) Calculate the break-even point.
(4 marks)
- b) Draw a break-even chart showing the company's current position.
(5 marks)
- c) Calculate the margin of safety at 45,000 units.
(4 marks)
- d) Calculate the profit if annual output falls to 75%.
(7 marks)
- e) Discuss the limitations of using break-even analysis.
(5 marks)

Section B

Question 2

Stuart Engineering Ltd has decided to invest in some new milling equipment for their machine shop. The initial capital investment is £200,000 and the company has selected three potential projects to evaluate. The anticipated cash flows for each project is as follows:

Year	Project A £	Project B £	Project C £
0	(200,000)	(200,000)	(200,000)
1	80,000	60,000	70,000
2	50,000	50,000	60,000
3	45,000	50,000	50,000
4	40,000	60,000	60,000

- a) Calculate the payback for each project in years and months.

(9 marks)

- b) Calculate the net present value for each project using a discount factor of 10%.

(9 marks)

Discount factors at 10%

Year	Discount factor
0	1.000
1	0.9091
2	0.8264
3	0.7513
4	0.6830
5	0.6210

- c) Comment on your findings stating which project you would choose.

(3 marks)

- d) When making capital investment decisions evaluate two factors that should be considered as part of the decision-making process.

(4 marks)

Question 3

The right location does not guarantee success, but the wrong location will certainly guarantee failure.

- a) Discuss what factors need to be considered when evaluating where the location for a new warehouse or factory should be.

(13 marks)

- b) A manufacturing facility plans to take components from three suppliers and send the finished products to six customers. The locations of the customers and suppliers and the amount supplied/demanded are shown in Table 1

Table 1 Location of customers and suppliers in relation to demand

Location	X Y coordinates	Supply/demand (units)
Supplier 1	91, 18	40
Supplier 2	93, 25	90
Supplier 3	4, 46	60
Customer 1	83, 26	24
Customer 2	89, 24	86
Customer 3	63, 57	32
Customer 4	11, 85	78
Customer 5	9, 27	92
Customer 6	44, 57	48

Using centre of gravity techniques calculate the best possible area in which to locate the manufacturing facility.

(12 marks)

Question 4

Change is happening all the time with tried and tested approaches being replaced by new technology or ideas.

- a) Explain seven reasons why change can fail in organisations.

(14 marks)

- b) Force field analysis is a method of identifying what factors are driving change and those factors that are preventing the change. Analyse what factors drive change and those factors that restrain change.

(11 marks)

Section C

Question 5

Sketty Sports Cars currently produce vehicles for the UK sports 2000 regulations. Recent technical changes in the regulations allow for the use of external carbon fiber body work panels.

The team have decided to produce the panels in house and are obtaining quotes for an Autoclave (a large pressure cooker for curing panels in their moulds). In order to compare competitive quotations from different potential suppliers from different countries, Sketty Sportscars require a Request For Quotation (RFQ) document.

- a) Generate an RFQ for the autoclave. Briefly explain the reasoning behind the inclusion of each of your criteria. **(12 marks)**

Sketty Sports Cars are concerned about the initial purchase price and operating costs for the autoclave.

- b) Explain the concept of life cycle costing. **(3 marks)**
- c) Critically evaluate the factors that should be considered to generate a life cycle cost for the Autoclave. **(10 marks)**

Question 6

Explain the concept of Total Quality Management

(5 marks)

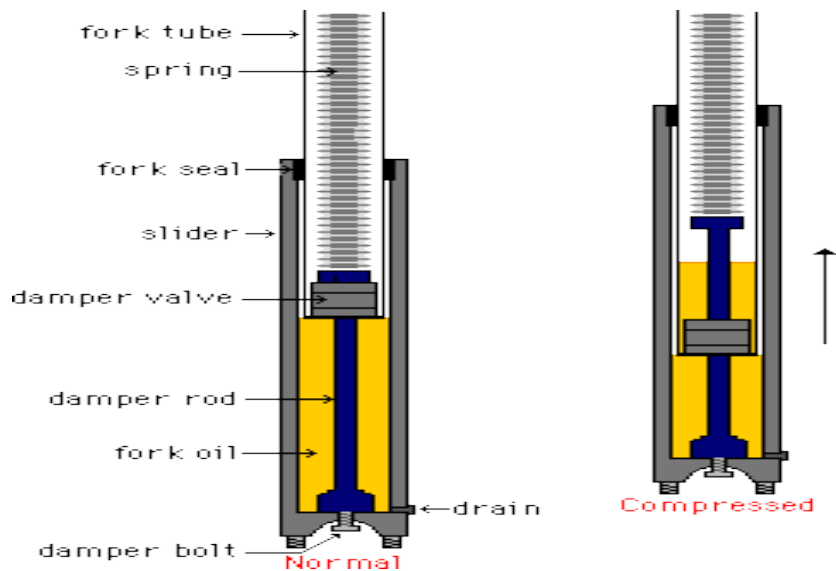
Outline a total Quality Management Strategy. Refer to Juran's 10 steps.

(6 marks)

What are the potential effects of not having a robust engineering quality system?

(3 marks)

Many engineering organizations utilize Fault Reporting And Corrective Action Systems (FRACAS). Imagine that you are working for a volume motorcycle engineering manufacturer. It has been reported that some telescope damper fork seals are leaking regularly on a recently released motorcycle. (see below)



You have been asked to identify any possible causes of this failure. Create an Ishikawa (herring bone) diagram of possible causes. Explain significant design error potential causes that may require more detail investigation. Use diagrams as required.

(11 marks)

Question 7



The City and County of Swansea wish to improve their public transport network. They are considering adopting a test fleet of ‘hybrid diesel electric buses’.

- i) Briefly discuss possible reasons for the City and County of Swansea to consider this change.

(4 marks)

- ii) Perform a PEST/STEP analysis on impact to the city bus operators running (or potentially running) hybrid buses on their fleet..

(16 marks)

- iii) Following the results of your analysis; what advice would you offer the city and county of Swansea and the bus operators on the potential adoption of some Hybrid buses.

(5 marks)