Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020

COURSE NAME	:	CONCURRENT AND REVERSE ENGINEERING
COURSE CODE	:	BNM 40603
PROGRAMME CODE	:	BNM
EXAMINATION DATE	:	DECEMBER 2019 / JANUARY 2020
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FIVE (5)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

Q1 (a) Concurrent engineering, also called simultaneous engineering. It is a process for designing and creating products in which project workers carry out each stage at the same time, rather than one after the other. Explain **FOUR (4)** ways that Concurrent Engineering shortens the 'lead time'.

(4 marks)

(b) Concurrent Engineering is delivering better, cheaper, and faster products to the market by a lean way of working, using multi-disciplinary teams, right first time methods and parallel processing activities. Explain how getting everything 'right the first time' benefit to the company.

(4 marks)

(c) When two or more individuals are classed together either by the organization or out of social needs, it is known as a 'group'. On the other hand, a 'team' is the collection of people who are linked together to achieve a common objective. Distinguish between a regular 'group' and a 'team'. Provide a specific example in UTHM community for each category.

(6 marks)

(d) Problems which are discovered at the early stage of the product development process (particularly during the first 20% of the cycle time) are easier to solve than those which are discovered later. It is undeniable that early problem discovery is crucial in Concurrent Engineering. Suggest **THREE (3)** ways to achieve early problem discovery.

(6 marks)

Q2 (a) Design for manufacture and assembly (DFMA) is the practice of designing products with manufacturing in mind and it considers manufacturing issues early to shorten product development time and ensure smooth transitions to manufacturing. Using the relevant principles of DFMA, explain how these advantages are achieved.

(6 marks)

(b) The process of manual assembly can be divided into two separate areas which are handling (acquiring, orienting and moving the parts) and, insertion and fastening (mating a part to another part or group of parts). Explain and demonstrate the design guideline for part handling with the aid of sketch.

(8 marks)

(c) Modular product design, flexible manufacturing process and sophisticated order management are some of the keys to the success of mass customization. Conclude on how each of these 'keys' can make mass customization as efficient and economically feasible as mass production.

(6 marks)

Q3 (a) Robust Design method, also called the Taguchi Method, greatly improves engineering productivity. By consciously considering the noise factors (environmental variation during the product's usage, manufacturing variation, and component deterioration) and the cost of failure. Identify **THREE (3)** reasons for companies to use Robust Design Method.

(6 marks)

(b) Group technology or GT is a manufacturing technique in which parts having similarities in geometry, manufacturing process and/or functions are manufactured in one location using a small number of machines or processes. Point out **FOUR (4)** advantages of using GT in a manufacturing environment.

(8 marks)

(c) Axiomatic design is a systems design methodology using matrix methods to systematically analyze the transformation of customer needs into functional requirements, design parameters, and process variables. It is also considered to be a design method that addresses fundamental issues in Taguchi methods. Conclude the advantages that you can get from this design method.

(6 marks)

Q4 (a) The product life cycle describes the period of time over which an item is developed, brought to market and eventually removed from the market. The cycle is broken into four stages: introduction, growth, maturity and decline. Interpret **THREE (3)** key points on how the design for life cycle may contribute to a sustainable development.

(6 marks)

(b) Materials management as a definition is the process which integrates the flow of supplies into, through and out of an organization to achieve a level of service which ensures that the right materials are available at the right place at the time in the right quantity and quality and at the right cost. Outline **THREE (3)** types of flow for improving materials in Material Management Strategies.

(6 marks)

(c) Life-cycle assessment is a technique to assess environmental impacts associated with all the stages of a product's life from raw material extraction through materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recycling. Conclude the concept of 'cradle-to-grave' in LCA process with the aid of sketch.

(8 marks)

Q5 (a) Identify **FOUR (4)** typical applications in Reverse Engineering.

(4 marks)

(b) Reverse engineering the reproduction of another manufacturer's product following detailed examination of its construction or composition. Explain **FOUR (4)** reasons a manufacturer uses Reverse Engineering.

(4 marks)

(c) Value engineering (VE) is a systematic method to improve the "value" of goods or products and services by using an examination of function. Value, as defined, is the ratio of function to cost. Predict and explain **FOUR (4)** impacts by extending Reverse Engineering to Value Engineering (VE) in organizations.

(12 marks)

Q6 (a) Prototype testing allows the product design to come alive; highlighting the beauty and functionality of it but also shining a light on any flaws which can then be rectified before full-scale manufacturing begins. Discuss **THREE (3)** benefits of prototype testing.

(6 marks)

(b) Failure analysis is the process of collecting and analyzing data to determine the cause of a failure and often with the goal of determining corrective actions or liability. Failure analysis can save money, lives, and resources if done correctly and acted upon. It is an important discipline in many branches of manufacturing industry. As a testing engineer, conclude **THREE (3)** significance of the failure analysis.

(6 marks)

(c) Verification is intended to check that a product, service, or system (or portion thereof, or set thereof) meets a set of design specifications. With the aid of sketch, justify the flow on how to conduct a preparation of verification activities.

(8 marks)

- END OF QUESTIONS -