LEAN OPERATIONS AND SUPPLY CHAIN MANAGEMENT
23WSD203

Semester 2
In-Person Exam paper

This examination is to take place in-person at a central University venue under exam conditions. The standard length of time for this paper is **2 hours**.

You will not be able to leave the exam hall for the first 30 or final 15 minutes of your exam. Your invigilator will collect your exam paper when you have finished.

Help during the exam

Invigilators are not able to answer queries about the content of your exam paper. Instead, please make a note of your query in your answer script to be considered during the marking process.

If you feel unwell, please raise your hand so that an invigilator can assist you.

Answer **ALL FOUR** questions.

Questions carry the marks shown.

Begin the answer to each question on a new page.

Use of a calculator is permitted - It must comply with the University's Calculator Policy for In-Person exams, in particular that it must not be able to transmit or receive information (e.g. mobile devices and smart watches are not allowed).

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1.

a) Evaluate the usefulness of systems thinking and systematic thinking in exploring and creating effective solutions to problems associated with lean operations and supply chain management. [10 marks]

b) Use the Likelihood-Consequence matrix to locate acceptance, avoidance, retention and sharing strategies for risk management. State how the risk management strategies can be applied in manufacturing businesses. [10 marks]

c) Discuss how Just-in-time (JIT) and Autonomation (Jidoka) supports the elimination of wastes and defects in the Toyota Production System (TPS). [10 marks]

2. Discus five ways that artificial intelligence (AI) tools can facilitate an effective supply chain management within the context of industry 4.0. [10 marks]

3. Clearly outline ten (10) concepts that make the Toyota Production System (TPS) very effective for lean operations using bullet points. [10 marks]

4.

a) The 'Control' step within the DMAIC process flow introduces interventions that strive to control the improved process performance. Highlight two interventions that will assist. [5 marks]

b) Table 1.0 provides the data from a production run of components machined on a CNC lathe. Calculate the Cp & Cpk values. In addition, what do the Cp & Cpk values indicate with regards to process performance.

The Upper Specification Limit (USL) for the component = 41.5mm

The Lower Specification Limit (LSL) for the component = 40.5mm

Constant (d2) = 2.326

Table 1.0 Processing data

Date		3rd Dec									
Time		8	9	10	11	12	13	14	15	16	17
	X1	40.2	40.7	40.8	41.3	40.7	40.5	41.3	41.5	40.6	41.6
	X2	40.7	41.2	42.5	41.8	40.8	41.3	40.7	41.2	40.3	41.2
	X3	41.4	41.6	41.5	41.2	41.7	40.6	40.5	40.9	41.2	40.9
	X4	40.9	40.5	41.0	40.9	41.5	41.4	41.2	41.1	40.2	41.1
	X5	41.00	40.9	41.2	40.8	41.3	40.6	41.2	41.4	40.1	40.8

$$Cp = \frac{(USL - LSL)}{6\sigma}$$

$$CpU = \frac{USL - Xbarbar}{3\sigma} \quad \text{or} \quad CpL = \frac{Xbarbar - LSL}{3\sigma}$$

[15 marks]

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