



First Semester Examination
2021/2022 Academic Session

February/March 2022

EPM451 – Computer Integrated Manufacturing

Duration : 3 hours

Please check that this examination paper consists of SEVEN [7] printed pages before you begin the examination.

INSTRUCTIONS : Answer **ALL FOUR [4]** questions.

In the event of any discrepancies, the English version shall be used.

- 1.
- 2.
3. In this case study, a paper packaging factory wishes to perform a simulation study on its production based on the job shop layout. The job shop consists of 20 different machines and equipment and products are high mix and low volume. The production performance measurements include the throughput time, on-time-delivery and work-in-process (WIP) level.
 - [a] Name ONE (1) entity, ONE (1) attribute, ONE (1) activity, ONE (1) event and ONE (1) state variable in this simulation. (2.5 marks)
 - [b] Give ONE (1) example how this simulation can be constructed through progressive model building. (2.5 marks)
 - [c] Propose ONE (1) suitable method to decide on the warm-up period. (2.5 marks)
 - [e] Perform validation based on the data obtained from 10 replications of simulation runs (Table 3). The 95% Confidence Interval of average WIP in the actual production is (400.034, 533.378).

Table 3

Replication	Random Numbers for:			Average WIP
	Part arrival time	Lot size	Cycle time	
1	1	10	7	420
2	2	9	8	380
3	3	8	9	487
4	4	7	10	378
5	5	6	1	489
6	6	5	2	587
7	7	4	3	365
8	8	3	4	355
9	9	2	5	423
10	10	1	6	543

(2.5 marks)

...3/-

4. A manufacturing company currently uses the printed quality control plan as shown in Figure 4. The company is interested in developing a relational business database to digitalize the quality control plan. Propose a relational database composing of at least FIVE (5) normalized data tables and covering all data. Determine the primary and foreign keys of these data tables. Show relationships between these data tables with arrow lines.

QUALITY CONTROL PLAN								
Order: Model			Drawing No: DN-789012				Control Plan No: CP-3w	
Part No: GSF 33-A8-XV			Part Name: Generator Stator Frame				Date: 2.1.2022	
Part Sub-components: C1, C2, C3			Part Description: The frame supports the core of the stator and protects their three-phase winding.				Approved by: Nathan	
Type: Project items			Project Name: Generator XV					
No	Sub-component	Manufacturing and inspection process	Control item(s)	Relevant document and procedure	Frequency	Supplier	Quality record	Remarks
1	C1	Receiving inspection and material information	Mill sheet visual, dimensions	Purchase specification as per drawing	100 %	S1	Mill TC material record	All plates shall be UT tested & ID must be there
2	C1	Fit-up & marking inspection	Groove shape, angle, misalignment	As per drawing	100 %	S1	Fit up report	All line items.
3	C2	Welding	Welder, Welding electrode	ASME Sec. A35G107	100 %	S2	PT report	Welding spatters

Figure 4

(10 marks)

...4/-

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...5/-