



Study Programme	: Bachelor of Technology Honours in Engineering
Name of the Examination	: Final Examination
Course Code and Title	DMX7402 – Analysis of Manufacturing systems & Processes
Academic Year	: 2021/22
Date	: February 20, 2023
Time	: 09:30 hrs. – 12:30 hrs.
Duration	: 3 hours

General instructions

- 1) Read all instructions carefully before answering the questions
- 2) This question paper consists of 08 questions. All questions carry equal marks.
- 3) Answers any 05 questions only.

Question 01.

- a) Briefly explain what is a “manufacturing system” while elaborating on common characteristics for all manufacturing systems.
- b) What are the objectives of analyzing manufacturing systems?
- c) Briefly discuss the important performance measures you would consider if dealing with manufacturing systems.

Question 02.

- a) Name the three cases of part or product variety in manufacturing systems.
- b) Distinguish between fixed routing and variable routing in manufacturing systems consisting of multiple workstations.
- c) Briefly discuss functions of material handling in manufacturing systems.

Question 03.

- a) What are the types of manufacturing layouts in cellular manufacturing and explain them briefly.
- b) Give five (5) major benefits associated with the implementation of Group Technology in a batch type manufacturing system.
- c) Discuss the role of the Production Flow Analysis (PFA).

Question 04.

- a) Discuss what is meant by Single station manufacturing and briefly explain why single station manned cells are so widely used in industry.
- b) 1000 parts are to be produced. Cycle time is 10min. Determine number of machines given 40hrs availability. The work load is given by $WL = QT_c$ and number of work stations by $n = WL/AT$

Question 05.

- a) Explain the steps to be taken to determine the number of workstations that are required in a manufacturing system.
- b) A total of 6000 parts must be produced in the forging department during three days. Manually operated forging presses will be used to complete the job and the cycle time is 30 sec. Each press must be set up before production starts. Setup time for this job is 2.0 hr. How many presses and operators must be devoted to this production during the three days, if there are 08 hours of available time per day?

Question 06.

- a) Briefly discuss the common reasons for downtime on an Automated Production line.
- b) A 20 station Transfer line is being proposed to machine a certain component currently produced by conventional methods. The proposal received from the machine tool builder states that the line will operate at a production rate of 100 pc / hr at 100% efficiency. From a similar transfer line it is estimated that breakdowns of all types will occur at a frequency of $F = 0.20$ breakdowns per cycle & that the average downtime per line stop will be 10.0 minutes. Compute the following:
 - i. Production rate
 - ii. Line efficiency

Question 07.

- a) Describe the principle of flexible manufacturing systems. Why it is capable of producing wide range of lot sizes?
- b) What are the capabilities that a manufacturing system must possess in order to be flexible?
- c) Briefly describe five types of flexibilities in the context of flexible manufacturing systems.

Question 08.

- a) Consider a three-workstation flowline. The workstations each have an infinite buffer and contain 1, 3, and 2 machines respectively. The process time of the machines in workstation 1, 2 and 3 is 0.9, 3.0, and 1.9 hours respectively.
 - (i) Calculate the maximum throughput of the line.
 - (ii) Determine the flowtime of a lot for release rates under the maximum throughput.
 - (iii) Determine the mean wip-level in the line for the maximum throughput.

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