

**THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY**

**MECHANICAL ENGINEERING – FOURTH YEAR DEGREE**

**FIRST SEMESTER EXAMINATIONS – 2022**

**ME414 – FLEXIBLE MANUFACTURING SYSTEM**

**FRIDAY, JUNE 10, 2022 – 12:50 PM**

**TIME ALLOWED: 2 HOURS**

**INFORMATION FOR CANDIDATES**

1. You have 10 minutes to read the paper. You **must not** begin writing during this time.
2. Answer **All** questions and you can do them in any order.
3. **Use only ink.** Do not use pencil for writing except for drawings and sketches.
4. Write your **NAME** and **NUMBER** clearly on the front page. **Do it now.**
5. Calculators are permitted in the examination room. Cell phone, Notes and Textbooks are not allowed.

**PART ONE: MULTIPLE CHOICE****[10 MARKS]**

1. Flexible manufacturing systems (FMS) are reported to have a number of benefits. Which is NOT a reported benefit of FMS?
  - a) More flexible than the manufacturing systems they replace
  - b) Lead time and throughput time reduction
  - c) Increased quality
  - d) Increased utilization
2. Which materials-processing technology gives the advantage of precision, accuracy, and optimum use of cutting tools, which maximize their life and higher labor productivity?
  - a) Industrial robots
  - b) Computer-integrated manufacturing (CIM)
  - c) Flexible manufacturing systems (FMS)
  - d) NC (and CNC) machine tools
3. What do Flexible Manufacturing Systems (FMS) do?
  - a) Moves and manipulates products, parts or tools
  - b) Moves materials between operations
  - c) Co-ordinates the whole process of manufacturing and manufactures a part, component or product
  - d) Completely manufactures a range of components without significant human intervention during the processing
4. The type in which the range or universe of part styles that can be produced on the system.
  - a) Mix flexibility
  - b) Production flexibility
  - c) Volume flexibility
  - d) Product flexibility
5. FMS can be classified basing on:
  - a) Kinds of operation they perform
  - b) Number of machines
  - c) Level of flexibility
  - d) All of the given
6. One of the classifications of FMS based on the number of machines in the system.
  - a) Flexible manufacturing cell
  - b) Random-order FMS
  - c) Dedicated FMS
  - d) None of the above
7. Which of the following is not the type of FMS?
  - a) Flexible manufacturing cells
  - b) Flexible tool handling systems
  - c) Flexible transfer lines
  - d) Flexible machining systems
8. Full form of AS/RS is \_\_\_\_\_.
  - a) Automated Shorting and Retrieval System
  - b) Automated Storage and Revival System
  - c) Automated Shorting and Restoration System
  - d) Automated Storage and Retrieval System
9. AGVs cannot be used as \_\_\_\_\_.
  - a) Towing vehicles
  - b) Pallet trucks
  - c) Shorting machines
  - d) Fork trucks
10. Flexible Manufacturing System (FMS) is generally limited to firms involved in \_\_\_\_\_.
  - a) Mass production
  - b) Batch production
  - c) Both (A) and (B)
  - d) None of the above

**PART TWO: SHORT ANSWER****[10 MARKS]**

1. What are the types of layout configuration in FMS?
2. What is the difference between a dedicated FMS and a random-order FMS?

**PART THREE: SOLVE THE PROBLEMS****[20 MARKS]**

1. In each aisle of an AS/RS, there are 70 storage compartments in the length direction and 10 storage compartments vertically. The dimensions of the unit load in inches (in) are 50 (length), 45 (width) and 50 (height) respectively. The allowances designed for each storage compartment are:  $x = 8$  inch,  $y = 7$  inch and  $z = 10$  inch. Storage depth  $u$  in the number of unit load is 3. Determine the capacity per aisle and the dimensions of the single storage system.
2. The single command cycle system of a XYZ Inc. has cycle time per operation as 2 minutes. Expected system throughput for the corporation is 360 operations per hour. Number of storage space per system height is 15 and total number of storage spaces using a randomized policy is 9000. Assuming storage and retrieval operation take same time, determine:
  - a) Number of S/R machines;
  - b) Number of rows; and
  - c) Number of bays in each rows.