Computer Integrated Manufacturing System
(ME – 705/3)

Time : 3 hours   Use separate answer script for each half   Full Marks : 70
Answer SIX question ,taking THREE from each half
The questions are of equal value

Q1 a) What are the objectives of using of Automation.

b) Discuss different types of automation with examples.

c) Explain the importance of low cost automation in productivity in small and medium scale industries.

Q2 a) What is Flexible Manufacturing System. Discuss the need for flexibility in manufacturing in the present scenario.

b) What are the major element of FMS ? Discuss.

c) What are the process Flexibility and routing Flexibility in FMS. Explain how to attain process and routing flexibility.

Q3 a) What do you mean by automated inspection principles and methods.

b) Name the steps and then describe the operation of a machine vision system for inspection of a product .

Q4. a) Discuss the principles of automated material handling system.

b) What are the important factors considered in selection of automated material handling equipment?

c) Discuss working of any three commercially available material handling equipments.

Q 5 a) What is AGV? Explain the working. State its limitation.

b) Discuss Group Technology.

SECOND HALF

6. a) What are the main rules of writing a ladder diagram for a Programmable Logic Circuit?
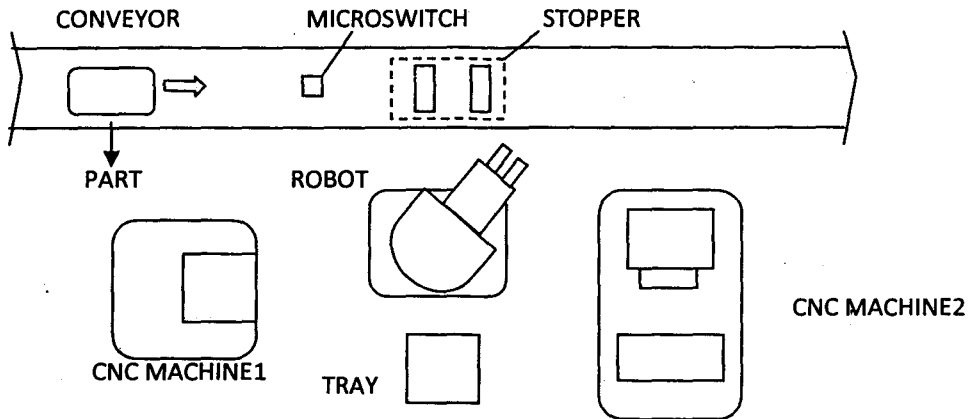

Fig. A: The Flexible Manufacturing System

b) Fig.A shows a part of a FMS where parts are automatically loaded on two CNC Machine with the help of a Robot. Write a ladder diagram to make the following sequence of operations (explain each step):

*   a part is carried by the conveyor and touches the micro-switch at an exact location.
*   The micro-switch gives signal to the stopper to stop that part if the robot is not busy (otherwise the part will be carried away by the conveyor)
*   If the CNC Machine1 is not busy the robot will pick the part from stopper and load it on the CNC Machine1.(robot program1)
*   If the CNC Machine1 finished the machining and CNC Machine2 is not busy and robot is not busy, robot will unload the part from the machine1 and place it on the CNC Machine2 (robot program2)
*   If CNC machine2 completes the job and robot is not busy unload the part from CNC Machine2 and put it onto the tray. (robot program 3)

7. a) With a neat sketch explain the coordinate system transformation for an robot which has a single link connected with the waist (which can rotate). Assume suitable dimensions for the robot components. Write the complete matrix equation to transform the coordinate of the end of the link to the fixed base of the robot.

    b) Write the type of joints used in a robot and their degrees of freedom.

8. a) Write different AND, OR, NOT logic for ladder diagram for a PLC.
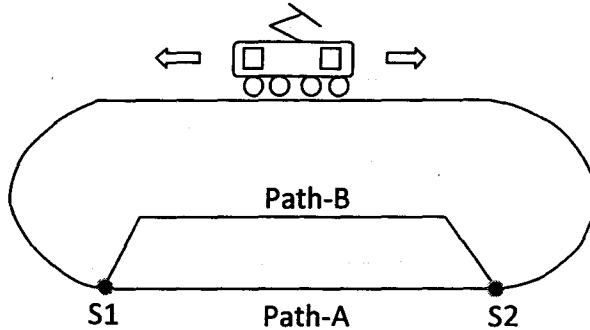   b) What is the difference between NO and NC switch? Give example.

Fig.-B : The railway track

c) Suppose the movement of an railway engine is to be automatically controlled by using a PLC. The engine can move any direction as per requirement and two separate start switches (pushbutton) may be used. The other switches S1 and S2 are used to control the movement of the engine either through Path-A or through Path-B. Write the complete ladder diagram for controlling engine and also explain each step. (Fig-B).

9. a) Explain the difference between CSG and B-Rep technique for representing a simple solid geometry.
   b) Explain the difference between the terms of CAD : geometry and topology.
   c) Explain how the shapes of Bezier curves can be changed with sketches.

10. Write short notes on
   a) Integration of CAD and CAM (with actual example)
   b) Applications of industrial robot
   c) Geometric entities used in 2D and 3D CAD software.