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Total Number of Pages: 02

Course: IDD (B.Tech and M.Tech)

Sub_Code: RPR6D001

6th Semester Regular/Back Examination: 2024-25
SUBJECT: Computer Integrated Manufacturing and FMS
BRANCH(S): MANUTECH, MECH

Time: 3 Hours

Max Marks: 100

Q.Code: S167

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- a) Define automation and list two major automation strategies.
- b) Differentiate between hard automation and flexible automation.
- c) What is a Programmable Logic Controller (PLC)? State any two applications.
- d) How do you specify a robot?
- e) What is the difference between CNC and DNC machines?
- f) What do you mean by 'part family' in Group Technology?
- g) Mention two benefits of using Group Technology in manufacturing with examples.
- h) Define FMS. Mention its basic components.
- i) What do you mean by machine flexibility in the context of FMS?
- j) List the differences between CAQC and CIM.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- a) Explain the principles and strategies of automation. Discuss the elements and functions of an automated system.
- b) Describe the various levels of automation in manufacturing. How do they impact production efficiency?
- c) What is the product/production relationship? Derive any one mathematical model for production rate or utilization.
- d) Explain the anatomy of an industrial robot, including its control systems, end effectors, sensors, and actuators.
- e) Discuss the operation and components of PLC with neat sketches.
- f) Explain the structure of an NC part program with a suitable example. Describe the purpose of G-codes and M-codes used in the program.

- g) What is Group Technology? Explain the concept of part families, classification, and coding with suitable examples.
- h) Discuss the design of a machine cell. Explain the benefits and limitations of cellular manufacturing.
- i) Discuss the concept of concurrent engineering and its role in streamlining product development processes. Explain how concurrent engineering facilitates collaboration between design, engineering, and manufacturing teams to reduce time-to-market and improve product quality.
- j) Describe FMS layout configurations. How do you select material handling equipment for them?
- k) What are the objectives of computer-aided quality control (CAQC)? How do you integrate CAQC with CAD/CAM?
- l) Prepare a plan of action to implement CIM in a specific industry.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

(16 x 2)

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| Q3 | <p>How does automation influence product/production relationships? Evaluate the role of cost-benefit analysis in selecting an appropriate automation strategy in a manufacturing system.
Develop mathematical models for production rate, capacity, and utilization, and illustrate their application with examples.</p> | (16) |
| Q4 | <p>Show the kinematic parameters of a SCARA robot. Explain the characteristics of robot actuators and the desirable features of robotics sensors. Give a brief comparison of (a) electric and hydraulic actuators and (b) position sensors and proximity sensors.</p> | (16) |
| Q5 | <p>Explain the steps involved in designing a cellular manufacturing layout based on Group Technology. How does part classification and coding assist in production flow analysis and machine cell design? Support your answer with a suitable case or schematic.</p> | (16) |
| Q6 | <p>Explain the architecture and components of a Flexible Manufacturing System (FMS). Describe the planning and implementation of FMS in an industry, along with flexibility types and quantitative measures. Elaborate on the objectives and benefits of Computer Aided Quality Control (CAQC) by comparing and contrasting it with QC, and CIM.</p> | (16) |