

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION)

CLASS: BTECH  
BRANCH: PROD & IND ENGG.

SEMESTER : VII<sup>th</sup>  
SESSION : MO/2025

SUBJECT: PE401 COMPUTER INTEGRATED MANUFACTURING & CYBER-PHYSICAL SYSTEMS

TIME: 3 Hours

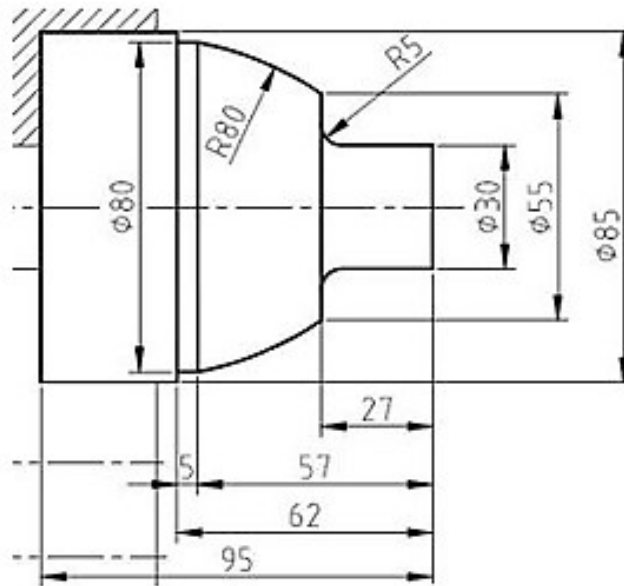
FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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- Q.1(a) Critically assess how the role of computers in manufacturing has evolved from simple data processing to enabling smart factories and Industry 4.0. What are the implications for workforce skills and management practices? [5] CO 01 BL 03
- Q.1(b) Analyze the concept of Concurrent Engineering (CE) in the context of CIM. How does CE reduce time-to-market, and what organizational changes are necessary for its successful implementation? [5] CO 01 BL 04

- Q.2(a) [5] CO 02 BL 04



- Write CNC Part Programming for the diagram.
- Q.2(b) Discuss the classification of CNC systems based on the number of control axes and machine functions. How does the complexity of control increase with axis count, and what implications does this have on system design and programming? [5] CO 02 BL 04
- Q.3(a) Critically analyze the role of different sensor types (proximity, optical, force/torque, and encoder-based) in maintaining precision and reliability in CNC and robotic manufacturing systems. How does sensor fusion improve decision-making in control systems? [5] CO 03 BL 04
- Q.3(b) Critically assess how modern AS/RS (Automated Storage and Retrieval Systems) and AGV (Automated Guided Vehicle) technologies are reshaping smart manufacturing logistics. Support your answer with real-world industrial examples or case studies. [5] CO 03 BL 04

PTO

- Q.4(a) Discuss and evaluate how scheduling and control strategies (hierarchical, distributed, and centralized) affect the overall efficiency and adaptability of FMS operations. Which strategy is most suitable for high-mix, low-volume production and why? [5] 04 04
- Q.4(b) Critically assess the role of Cellular Manufacturing as a transitional phase toward full FMS implementation. How does group technology influence layout, workflow, and performance within cellular systems? [5] 04 04
- Q.5(a) Evaluate the transformation from traditional automation to cyber-physical manufacturing systems (CPMS) in terms of system intelligence, flexibility, and resilience. How do feedback loops between physical and digital layers improve decision-making? [5] 05 03
- Q.5(b) Design and justify a conceptual smart factory framework that integrates IoT, CPMS, AR/VR, and predictive analytics for adaptive manufacturing. Discuss how this framework supports mass customization and real-time decision-making. [5] 05 03

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