

**ADVANCED MANUFACTURING AND AUTOMATION
(MECH 4111)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

**Group – A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) Automated Guided Vehicle (AGV) is used for material transfer between [CO1]
(a) two fixed location in single direction
(b) two fixed location in bi- direction
(c) any location to any location single direction
(d) any location to any location bi-direction.
- (ii) Cellular Manufacturing relates to [CO3]
(a) product layout
(b) process layout
(c) group layout
(d) all of these.
- (iii) The effects on labour workforces when Flexible Manufacturing System (FMS) concept is used [CO3]
(a) increases
(b) decreases
(c) remain same
(d) gradually increases with time
- (iv) Circular Interpolation (clockwise) in CNC is implemented by the G-code [CO4]
(a) G00
(b) G01
(c) G02
(d) G03.
- (v) Which of the following method is not related to Rapid prototyping? [CO5]
(a) Stereolithography
(b) Fused deposition
(c) Selective laser sintering
(d) Reverse sintering.
- (vi) In CNC programming M06 is used for [CO4]
(a) spindle start
(b) spindle stop
(c) tool change
(d) program end.
- (vii) Which of the following method is related to Computer Aided Process Planning (CAPP)? [CO2]
(a) Generative type
(b) Uniform type
(c) Universal type
(d) Reform type.

- (vii) Mechanics of material removal in Electro-Discharge Machining (EDM) is [CO6]
(a) melting and evaporation aided by cavitation
(b) mechanical cutting action
(c) melting
(d) electrolysis.
- (ix) Which of the following material is not generally machined by Ultrasonic Machining (USM)? [CO6]
(a) Copper (b) Glass (c) Silicon (d) Germanium.
- (x) The laser beam machining can be carried out, when the media for energy transfer between the tool and work piece is [CO6]
(a) air (b) liquid
(c) vacuum (d) any one of the above medium.

Group - B

2. (a) Define Constructive Solid Geometry (CSG). Discuss with suitable sketches the two solid modelling techniques used in CAD. [(CO1) (Apply/IOCQ)]
(b) Define Flexible Manufacturing System (FMS). Describe the benefits of Flexible Manufacturing System. [(CO3) (Understand/LOCQ)]
6 + 6 = 12
3. (a) Develop a plan to integrate automated storage and retrieval systems in a manufacturing plant. [(CO3) (Create/HOCQ)]
(b) Define Cellular Manufacturing. With proper example explain the term Intelligent Manufacturing. [(CO3) (Understand/LOCQ)]
6 + 6 = 12

Group - C

4. (a) Develop a CNC part program with diagram to remove 3 mm material from outer diameter of the work piece by turning operation in two cuts (2 mm and 1 mm respectively). Where,
Material: Mild steel
Work piece diameter = 60 mm
Work piece length = 50 mm
Feed rate = 0.25mm/ revolution
Spindle speed is 1000 rpm [(CO4) (Create/HOCQ)]
(b) Explain the function of Recirculating Ball-Screw and Nut in CNC. [(CO4) (Understand/LOCQ)]
6 + 6 = 12
5. (a) Distinguish between open and closed loop numerical control with diagram. [(CO4) (Analyze/IOCQ)]
(b) Define automation. Describe the three basic types of automated manufacturing systems. [(CO4) (Understand/LOCQ)]
6 + 6 = 12

Group - D

6. (a) Explain the procedure to code a product and identify it's part family applying the principle of group technology. [(CO5) (Apply/IOCQ)]
 (b) Describe working principle and importance of any one non contact computer aided quality control (CAQC) method. [(CO2) (Understand/LOCQ)]
6 + 6 = 12
7. (a) Write the setup, steps and importance of 3D printing technology with figure. [(CO5) (Apply/IOCQ)]
 (b) How to measure coordinates of a product with the help of Co-ordinate Measuring Machine (CMM)? [(CO2) (Evaluate/HOCQ)]
6 + 6 = 12

Group - E

8. (a) Describe the function of gas propulsion system and abrasive feeder present in Abrasive Jet Machining (AJM). [(CO6) (Understand/LOCQ)]
 (b) State the purpose of acoustic head used in Ultrasonic Machining (USM) also list the name of different types of concentrator used in USM. [(CO6) (Remember/LOCQ)]
6 + 6 = 12
9. (a) Interpret the significance of electrolyte used in Electro-chemical Machining (ECM). Also discuss about the effect of high temperature and pressure of electrolyte on the ECM process. [(CO6) (Apply/IOCQ)]
 (b) Distinguish between transfer mode and non-transfer modes circuit used in Plasma Arc Machining and also State the advantages of Plasma Arc Machining. [(CO6) (Analyse/IOCQ)]
6 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	43.75%	37.50%	18.75%

Course Outcome (CO):

After the completion of the course students will be able to

CO 1	Explain working knowledge on computer integration with mechanical systems.
CO 2	Discuss about computer aided design, manufacturing, process planning and quality control.
CO 3	Explain cellular, flexible manufacturing system and automated material handling, storage, retrieval system.
CO 4	Distinguish Automation, types of Automation and Production, NC and CNC system, Motion transmission, Slides and guides, CNC programming.
CO 5	Implement reverse engineering, group technology, rapid prototyping in industrial application
CO 6	Compare non-traditional machining processes and their application.

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question;
HOCQ: Higher Order Cognitive Question

Department & Section	Submission link:
ME-A	https://classroom.google.com/c/NDA1MjEzNjQwMjM4/a/NDY0MTYxMTA0NDYz/details
ME-B	https://classroom.google.com/c/NDA0MzI1NDcxMzI1/a/NDU0OTExMTU0MjY5/details