

MODERN MANUFACTURING TECHNOLOGY
(MECH 4222)

Time Allotted : 2½ hrs

Full Marks : 60

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 4 (four) from Group B to E, taking one from each group.*

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

Group – A

1. Answer any twelve:

12 × 1 = 12

Choose the correct alternative for the following

- (i) Material removal rate in electro-chemical machining (ECM) depends on
 - (a) Hardness of work material
 - (b) Atomic weight of work material
 - (c) Thermal conductivity of work material
 - (d) Ductility of work material
- (ii) The ability of a material to be plastically deformed without fracturing is termed as
 - (a) Elasticity
 - (b) Hardness
 - (c) Toughness
 - (d) Ductility
- (iii) Water jet machining (WJM) can be classified as the following type of non-traditional machining process
 - (a) Optical
 - (b) Mechanical
 - (c) Electrical
 - (d) Chemical
- (iv) Choose the correct sequence to generate prototype.
 - (a) 3D CAD data - CAD solid model - STL file - RP prototype
 - (b) CAD solid model - 3D CAD data - RP prototype - STL file
 - (c) STL file - 3D CAD data - CAD solid model - RP prototype
 - (d) 3D CAD data - STL file - CAD solid model - RP prototype
- (v) Which of the following is a high energy rate forming process?
 - (a) Extrusion method
 - (b) Deep drawing method
 - (c) Coining method
 - (d) Explosive method

- (vi) Mechanics of material removal in electric discharge machining (EDM) is
 - (a) Melting and evaporation aided by cavitation
 - (b) Mechanical cutting action
 - (c) Melting
 - (d) Electrolysis
- (vii) Laser beam is produced due to
 - (a) Spontaneous emission
 - (b) Stimulated emission followed by spontaneous emission
 - (c) Spontaneous emission followed by spontaneous absorption
 - (d) Spontaneous absorption followed by stimulated emission
- (viii) The mechanism that controls the tool movement in a shaper machine is known as
 - (a) Gear train
 - (b) Feed mechanism
 - (c) Quick return mechanism
 - (d) Drive mechanism
- (ix) As the stand-off distance increases, the depth of penetration in abrasive jet machining (AJM)
 - (a) Increases
 - (b) Decreases
 - (c) Does not change
 - (d) Initially increases then remain steady
- (x) In group technology groups are formed based on the similarity of
 - (a) Design
 - (b) Manufacturing
 - (c) Dimension
 - (d) Both (a) and (b)

Fill in the blanks with the correct word

- (xi) Full form of "LASER" is _____.
- (xii) Selective laser sintering is a process of _____.
- (xiii) In DCEN electrodes are attached with _____ terminal.
- (xiv) The acoustic head is associated with _____.
- (xv) Abrasive jet machining (AJM) uses a jet of _____.

Group - B

2. (a) What is longitudinal and cross feed in the lathe? Explain the application of any three lathe operations with suitable figures. [[CO1](Apply/IOCQ)]
- (b) Describe the following items of the gating system with suitable sketches.
 - (i) Cope box, (ii) Runner, (iii) Riser, (iv) Core.

[[CO1] (Understand/LOCQ)]

(2 + 4) + 6 = 12

3. (a) Explain pressing and blanking operations with figures. *[[C01) (Understand/LOCQ]]*
 (b) Differentiate between ductility and brittleness. *[[C02) (Analyze/IOCQ]]*
6 + 6 = 12

Group - C

4. (a) Justify the reason to choose CNC over NC system. *[[C03) (Analyze/IOCQ]]*
 (b) Demonstrate the steps of rapid prototyping process. *[[C03) (Apply/IOCQ]]*
6 + 6 = 12
5. (a) What is the importance of cellular manufacturing as an application of group technology? *[[C04) (Evaluate/HOCQ]]*
 (b) Explain opitz coding and classification system in group technology. *[[C04) (Understand/LOCQ]]*
6 + 6 = 12

Group - D

6. (a) Describe the various types of energy sources used in non-traditional machining techniques. Write down the name of abrasives used in abrasive jet machining (AJM) process. *[[C05)(Remember/LOCQ]]*
 (b) Write down the purpose of acoustic head used in ultrasonic machining (USM) process. Draw the schematic layout of water jet machining (WJM) and explain its operating characteristics. *[[C05)(Apply/IOCQ]]*
(3 + 3) + (3 + 3) = 12
7. (a) Briefly explain the significance of electrolyte used in electro-chemical machining (ECM). Show chemical reactions that takes place in electrolyte, anode and cathode during ECM process. *[[C05)(Remember/LOCQ]]*
 (b) Draw the resistance-capacitance relaxation circuit used in electric discharge machining (EDM) process. Prove that for maximum power delivery, the discharge voltage should be equal to 72% of the supply voltage in EDM process. *[[C05)(Analyse/HOCQ]]*
6 + (2 + 4) = 12

Group - E

8. (a) State the functions of flash lamp and lens used in laser beam machining (LBM) and also state the applications of LBM process. *[[C05)(Remember/LOCQ]]*
 (b) With a simple diagram explain the working principle of plasma arc machining (PAM) process. *[[C05)(Apply/IOCQ]]*
(4 + 2) + 6 = 12
9. (a) What is the principle behind electron beam machining? What safety precautions are necessary when working with electron beam machining? *[[C05)(Remember/LOCQ]]*
 (b) Demonstrate the set-up and principle of the explosive forming process with figure. *[[C06) (Apply/IOCQ]]*
6 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	43.75	43.75	12.5

Course Outcome (CO):

After the completion of the course students will be able to

At the end of the course, a student will be able to:

1. Explain basic idea about conventional manufacturing processes.
2. Describe different mechanical properties.
3. Discuss basic ideas of NC and CNC machines and Rapid Prototyping.
4. Explain working knowledge on Computer Integration in manufacturing.
5. Discuss various Non-traditional Machining processes and their application.
6. Explain the basic idea of high energy rate forming processes.

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