

GUJARAT TECHNOLOGICAL UNIVERSITY

BE-6 SEMESTER – OLD PAPER – S22 TO W25 – QUESTION BANK

Subject Name & Code:

ADVANCED MANUFACTURING PROCESSES- 3161922

Unit 1: Unconventional Machining Processes

Repeated Questions:

1. Classify Unconventional Machining Processes based on the type/source of energy used. (W23 - Q1a, 03; S22 - Q1a, 03; W24 - Q1b, 04)
2. Explain the need/requirement/importance of Unconventional/Advanced Manufacturing Processes. (S22 - Q1a, 03; S23 - Q1a, 03; W24 - Q1a, 03; W22 - Q1a, 03)
3. Explain the Abrasive Jet Machining (AJM) process in detail with a neat diagram/sketch. (S23 - Q1c, 07; W23 - Q2c, 07; W22 - Q1c, 07)
4. Explain the Electric Discharge Machining (EDM) process in detail with a neat diagram/sketch and its working principle. (S23 - Q1c, 07; W23 - Q2c, 07; S22 - Q2b, 04)
5. Distinguish/Differentiate between Conventional and Non-Conventional Machining Processes. (S23 - Q2b, 04; S22 - Q1c, 07; W24 - Q2b, 04)
6. Explain the mechanism of material removal in AJM. (S25 - Q1b, 04; S24 - Q2b, 04; W24 - Q3b, 04)
7. Explain the Water Jet Machining (WJM) process with a neat sketch. (W24 - Q1c, 07; W23 - Q3c, 07)
8. What are the applications of Laser Beam Machining (LBM)? (S22 - Q2a, 03; S24 - Q1b, 04)
9. Enlist/Discuss the process parameters of Electrochemical Machining (ECM) and their effect on Material Removal Rate (MRR). (S22 - Q2c, 07; S23 - Q2c, 07; W24 - Q3b, 04)
10. Explain the Ultrasonic Machining (USM) process with a neat sketch. (S25 - Q2c, 07; W24 - Q3c, 07)

Other Important Questions:

1. A furniture company that makes upholstered chairs and sofas must cut large quantities of fabrics. Many of these fabrics are strong and wear-resistant. These properties of fabrics make them difficult to cut. Which non-traditional process would you recommend to the company for this application? Justify your answer by indicating the characteristics of the process that make it attractive and support your selection. (W25 - Q1a, 03)
2. Enlist the requirements that demand the use of advanced manufacturing processes. (W25 - Q1b, 04)
3. An ECM operation is to be used to cut a hole into a plate of aluminum that is 12 mm thick. The hole has a rectangular cross-section, 10 mm $\times$ 30 mm. The ECM operation will be accomplished at a current = 1200 amps. Efficiency is expected to be 95%. Specific removal rate for aluminum is 0.0344 mm³/A·s. Determine feed rate, MRR and time required to cut through the plate. (W25 - Q1c, 07)
4. Write the classification of Thermal Energy Based Unconventional Machining Processes. (S23 - Q1b, 04)
5. Explain the mechanism of material removal in Laser Beam Machining (LBM). (W25 - Q3b, 04)
6. Write the differences between WJM and AWJM processes. (W25 - Q2b, 04)
7. Why AJM is not recommended to machine ductile materials? (W25 - Q2a, 03)
8. Why flushing of dielectric is needed in EDM? List different techniques of flushing and discuss any two techniques with aid of neat sketch. (W25 - Q2c, 07)
9. Describe mechanism of material removal and energy distribution in EDM with aid of neat

- sketch. (W25 - Q2c OR, 07)
10. Why vacuum environment is needed in electron beam machining? (W25 - Q3a, 03)
 11. Explain working principle of ultrasonic machining with neat sketch. Also, describe functions of slurry, horn, transducer, and oscillator. (W25 - Q3c, 07)
 12. Write in table form, the basic differences between CHM and ECM. (W25 - Q3a OR, 03)
 13. Discuss the material removal mechanism of plasma arc machining. (W25 - Q3b OR, 04)
 14. Explain working principle of abrasive water jet machining with neat sketch. Also, describe applications, limitations, and merits of the process. (W25 - Q3c OR, 07)
 15. Give the classification of mechanical energy based processes. (W24 - Q1b, 04)
 16. List and explain the various factors to be considered for selecting machining processes. (S24 - Q1c, 07)
 17. What are the advantages of non-conventional machining processes over conventional machining processes? (S24 - Q1a, 03)
 18. What are the different modes of operation of plasma torches? Explain any one. (S24 - Q1b, 04)
 19. What are the requirements of dielectric fluid in EDM? Mention any two dielectric fluids used in EDM process. (S24 - Q2a, 03)
 20. What is ultrasonic machining? Explain the ultrasonic machining process with a schematic diagram. (S24 - Q2b, 04)
 21. Find out the approximate time required to machine a hole of diameter 6 mm in a Tungsten carbide plate. (Flow strength of work material $6.9 \times 10^9 \text{ N/mm}^2$) of thickness equal to one and half time of hole diameter. The mean abrasive grain size is 0.015 mm diameter. The feed force is equal to 3.5 N. The amplitude of tool oscillations is 25 microns. And the frequency is equal to 25 KHz. The tool material is copper having flow strength $1.5 \times 10^9 \text{ N/mm}^2$. The slurry contains one part of abrasives to one part of water. Take the values of different constant as $k_1 = 0.3$, $k_2 = 1.8 \times 10^{-6}$ in SI Units and $K_3 = 0.6$ and abrasive slurry density = 3.8 gm/cm^3 . (Use grain hammering model) (S24 - Q2c OR, 07) [Figure or Table given - refer Question paper of Season Year]
 22. What are the various elements of electrochemical machining process? Explain. (S24 - Q3a, 03)
 23. What is insulation to the ECM tool? Why is it required? Explain. (S24 - Q3b, 04)
 24. In chemical milling operation on a flat mild steel plate, it is desired to cut an ellipse-shaped pocket to a depth of 10 mm. The semi axes of the ellipse are, $a = 225 \text{ mm}$ and $b = 150 \text{ mm}$. A solution of hydrochloric and Nitric acids will be used as the etchant. Determine (1) Metal removal rate in mm^3/hr . (2) Time required to etch to depth and (3) Required dimensions of the opening in the cut and peel maskant required to achieve the desired pocket size on the part. (Take Etch Factor = 2) (S24 - Q3c, 07)
 25. What is plasma arc machining? Explain mechanism of the metal removal. (S24 - Q3a OR, 03)
 26. State the function of dielectric fluid in EDM, and also name the most commonly used dielectric fluid in EDM. (S25 - Q3a, 03)
 27. Differentiate between EDM and Wire EDM. (S25 - Q3b, 04)
 28. Explain the process parameters of AJM that affect the MRR and accuracy of the machining process. (S25 - Q3c, 07)
 29. State the function of electrolytes in ECM, and also name the most commonly used electrolytes in ECM. (S25 - Q3a OR, 03)
 30. Describe the function of the intensifier and accumulator in the WJM process. (S25 - Q3b OR, 04)
 31. Explain the process variables of USM that affect the MRR of the machining process. (S25 - Q3c OR, 07)
 32. Explain the need of Unconventional Machining Processes. (S23 - Q1a, 03)
 33. What is the use of Intensifier in WJM Process? (S23 - Q3a OR, 03)
 34. Write the function of Maskant in CHM Process. (S23 - Q2a, 03)
 35. Draw Ishikawa Cause and Effect Diagram for USM Process. (S23 - Q3b, 04)
 36. Draw Ishikawa Cause and Effect Diagram for EDM Process. (S23 - Q3c OR, 07)
 37. Application of Wire cut EDM. (W23 - Q2a, 03)

38. Discuss Process parameters and its effect of Ultrasonic Machining (USM). (W23 - Q2b, 04)
39. Explain Chemical machining Process in detail with neat sketch. (W23 - Q2c OR, 07)
40. Application of Electro - Chemical machining. (W23 - Q3a, 03)
41. Write process parameter and its effect on MRR and surface finish of EDM process. (W23 - Q3b, 04)
42. Explain Electro Chemical grinding (ECG) Process in detail with neat diagram. (W23 - Q3c, 07)
43. Benefits of Resin Transfer Moulding (RTM). (W23 - Q3b OR, 04)
44. Write history of RP systems. (W23 - Q3a OR, 03)
45. What is Plasma Arc Machining (PAM)? Explain mechanism of the metal removal. (W22 - Q3a, 03)
46. What is LASER? explain types of Lasers with their properties. (W22 - Q3b, 04)
47. State any four essential requirements of dielectric fluid used in EDM. (W22 - Q3a OR, 03)
48. What is the keyhole? What is the mechanism of keyhole formation? (W22 - Q3b OR, 04)
49. Draw schematic diagram of Ultrasonic Machining (USM) and explain its element of process, application and limitation. (W22 - Q3c OR, 07)
50. Write comparison between Abrasive Jet Machining (AJM) and Abrasive Water Jet Machining (AWJM). (W22 - Q2a, 03)
51. Explain with sketch the principal of operation, mechanism of metal removal of Laser Beam Machining (LBM). Also write advantage, disadvantages and application of Laser Beam Machining. (W22 - Q2c, 07)
52. Justify the requirement of maskant in chemical machining process. (W24 - Q2a, 03)
53. Illustrate laser beam machining process with neat diagram. (W24 - Q2c, 07)
54. Explain electron beam machining process with neat sketch. (W24 - Q2c OR, 07)
55. Write advantages and disadvantages of electro chemical machining process. (W24 - Q3a, 03)
56. Explain the effect of process parameters on MRR in abrasive jet machining process. (W24 - Q3b, 04)
57. Explain electro discharge machining process in detail with neat diagram. (W24 - Q3c, 07)
58. Write applications of electro chemical grinding process. (W24 - Q3a OR, 03)
59. How MRR changes by changing the process parameters of wire cut EDM process? (W24 - Q3b OR, 04)
60. Illustrate ultrasonic machining process with neat sketch. (W24 - Q3c OR, 07)

Unit 2: Rapid Prototyping

Repeated Questions:

1. Explain the need/importance of Rapid Prototyping. (S23 - Q4a, 03; W24 - Q4a, 03)
2. Explain Fused Deposition Modelling (FDM) process in detail with neat sketch/advantages/disadvantages/applications. (S23 - Q4c, 07; W23 - Q4c, 07; W22 - Q4c, 07; W24 - Q4c, 07)
3. Explain Stereo Lithography (SLA) process in detail with neat sketch. (W23 - Q4c, 07; S22 - Q3c, 07; W22 - Q4b, 04)
4. Explain Laminated Object Manufacturing (LOM) process in detail with neat sketch/advantages/disadvantages/applications. (W25 - Q4c OR, 07; S23 - Q4c OR, 07; W22 - Q4c, 07)
5. Write advantages/disadvantages of Rapid Prototyping. (S23 - Q4a OR, 03; W22 - Q4a, 03; S25 - Q4a, 03)
6. Write differences between Additive and Subtractive Manufacturing. (W25 - Q4a, 03; S23 - Q4b, 04; W24 - Q4b, 04)
7. Classify the RP processes. (S25 - Q4a, 03; W23 - Q4b, 04)
8. What is prototyping? Enlist advantages of Rapid Prototyping. (W23 - Q4a, 03; W22 - Q4a, 03)
9. Write applications of Laminated Object Manufacturing (LOM) processes. (W23 - Q4b, 04; W22 - Q4b, 04)

Other Important Questions:

1. Write difference between additive and subtractive manufacturing. (W25 - Q4a, 03)
2. List major four process parameters which affects the build time in stereo-lithography (SLA). Also explain the correlation of these parameters on build time. (W25 - Q4b, 04)
3. Explain working principle, advantages and limitations of selective laser sintering (SLS). (W25 - Q4c, 07)
4. What is infill in 3d printing? How infill density affects the weight and strength of 3d printed part? (W25 - Q4a OR, 03)
5. List major four process parameters which affects the build time in fused deposition modelling (FDM). Also explain the correlation of these parameters on build time. (W25 - Q4b OR, 04)
6. Explain working principle, advantages and limitations of laminated object manufacturing (LOM). (W25 - Q4c OR, 07)
7. State any three specific applications of rapid prototyping processes (RP). (S22 - Q3a, 03)
8. "Rapid prototyping processes having short product development cycle compared to conventional processes" Evaluate the statement. (S22 - Q3b, 04; W22 - Q4b, 04)
9. Describe the Laminated Object Manufacturing with neat sketch. (S22 - Q3c OR, 07)
10. Write the any three applications of Fusion Deposition Modelling. (S22 - Q3a OR, 03)
11. Classify the RP processes based of source of energy used. (S22 - Q4b, 04)
12. Discuss the advantage and disadvantages of thermal jet printer processes. (S22 - Q4c, 07)
13. Write a note on 3D Printer. (W23 - Q4a OR, 03)
14. Give the classification of Rapid Prototyping processes. (W23 - Q4b OR, 04)
15. Describe the Selective Laser Sintering Process with a neat sketch. State their process parameters. (S25 - Q4c, 07)
16. Differentiate between the LOM process and Stereolithography (SLA) process. (S25 - Q4b, 04)
17. Explain the generic RP process. (S25 - Q4b OR, 04)
18. Explain the Solid Ground curing (SGC) process with a neat sketch. State their advantages. (S25 - Q4c OR, 07)
19. Define STL file format. What are the issues associated with STL file format? (S24 - Q4a, 03)
20. Explain photo-polymerization phenomenon of stereo lithography systems. (S24 - Q4b, 04)
21. Explain with sketch Fusion Deposition Modeling (FDM) principle, process parameter and applications. (S24 - Q4c, 07)
22. What are the difference between STL, OBJ and AMF file Formats? (S24 - Q4a OR, 03)

23. List down five most commonly used polymers in Additive manufacturing. Explain their advantages and limitations. (S24 - Q4b OR, 04)
24. Explain Laminated Object Manufacturing (LOM) principle, process parameter and applications. (S24 - Q4c OR, 07)
25. Write difference between Additive, Subtractive and Formative Manufacturing. (W22 - Q4a, 03)
26. Describe the Stereo Lithography Systems with neat sketch. (W22 - Q4c, 07)
27. Explain the importance of rapid prototyping process in recent scenario. (W24 - Q4a, 03)
28. State advantages, disadvantages of stereo lithography process. (W24 - Q4b, 04)
29. Illustrate laminated object manufacturing process with neat sketch and list its application. (W24 - Q4c, 07)
30. List the advantages of rapid prototyping process. (W24 - Q4a OR, 03)
31. Distinguish between additive and subtractive manufacturing processes. (W24 - Q4b OR, 04)

Unit 3: Glass Science

Repeated Questions:

1. Write glass compositions and its properties. (W23 - Q5a, 03; S24 - Q5a, 03; S22 - Q1b, 04)
2. List/Classify/Discuss glass forming processes. (W23 - Q5b, 04; S24 - Q5b, 04; S22 - Q5c, 07)
3. Draw Process Flow Diagram for Glass Manufacturing. (W23 - Q5a OR, 03; W22 - Q5a, 03)

Other Important Questions:

1. Explain press-and-blown forming of glass with neat sketch. (W25 - Q5a, 03)
2. Name two processes for forming glass fibers and briefly describe one of them. (W25 - Q5b, 04)
3. Describe the spinning process in glassworking with aid of neat sketch. (W25 - Q5a OR, 03)
4. Name the process by which uniformly thick and smooth glass sheet can be produced. Also, explain this process in brief with neat sketch. (W25 - Q5b OR, 04)
5. Enlist any three raw materials used to manufacture the glass. (S22 - Q4a, 03)
6. Write the short note on any one glass forming processes. (S22 - Q4c, 07)
7. Explain the terms Glass and Glassy State. (S22 - Q4a OR, 03)
8. Write the types of glass furnaces. (S22 - Q5a, 03)
9. Discuss the properties of glass. (S22 - Q5b, 04)
10. Explain Soda Lime Glass in detail. (W23 - Q5c, 07)
11. Explain any Glass process and write Application of Glass. (W23 - Q5c OR, 07)
12. State the function of the following in Glass manufacturing 1. Formers 2. Fluxes 3. Stabilizers. (S25 - Q5a, 03)
13. Describe the steps involved in the Glass manufacturing process. (S25 - Q5c OR, 07)
14. Explain Continuous Glass Fibers Process with neat sketch. (S23 - Q5b, 04; W22 - Q5b, 04)
15. Explain Soda Lime Glass in detail. (W24 - Q5c, 07)
16. Illustrate process flow diagram for glass manufacturing. (W24 - Q5a, 03)
17. Explain continuous glass fibres process with neat sketch. (W24 - Q5b OR, 04)
18. Explain phase transformation in glass during solidification. (S24 - Q5b OR, 04)
19. Explain Hand Lay-up process with sketch. Give advantages and limitations of it. (S24 - Q5c OR, 07)

Unit 4: Composite Materials

Repeated Questions:

1. Classify composite materials. (S22 - Q1c, 07; S25 - Q5a OR, 03; W22 - Q5a, 03)
2. Explain Filament Winding process with neat sketch. (S23 - Q5c, 07; S25 - Q5c, 07; W22 - Q5c, 07)
3. Explain Resin Transfer Moulding (RTM) process with neat sketch/advantages/applications. (W25 - Q5c OR, 07; S23 - Q5c OR, 07; W24 - Q5c, 07)
4. Explain Hand Lay-up/Wet Lay-up process with neat sketch. (W23 - Q5c, 07; S24 - Q5c, 07)
5. Explain Pultrusion process with neat sketch/advantages/applications. (W25 - Q5c, 07; S22 - Q5c, 07)
6. Write advantages of Filament Winding. (W23 - Q5a, 03; W22 - Q5a, 03)
7. Write the functions of matrix in composite materials. (S23 - Q5a, 03; W24 - Q5a OR, 03)
8. Write the limitations of composite materials. (S23 - Q5b, 04; W24 - Q5b, 04)

Other Important Questions:

1. Explain pultrusion process of composite manufacturing with its major applications, advantages and limitations. (W25 - Q5c, 07)
2. Explain resin transfer moulding process of composite manufacturing with its major applications, advantages and limitations. (W25 - Q5c OR, 07)
3. Define the composite material with any two examples. (S22 - Q5a OR, 03)
4. Determine the important process parameters of Spray Lay-Up. (S22 - Q5b OR, 04)
5. Summarize the polymer matrix composites in context of strength and stiffness compared to polymers. (S22 - Q5c OR, 07)
6. Explain Spray Lay-Up Process in detail with neat diagram. (S23 - Q5c OR, 07; W22 - Q5c, 07)
7. Benefits of Resin Transfer Moulding (RTM). (W23 - Q3b OR, 04)
8. Describe the current industrial applications of the composites. (S25 - Q5b, 04)
9. Compare the Hand Lay-up process and spray-up processes. (S25 - Q5b OR, 04)
10. Appreciate any four advantages of Resin Transfer Molding (RTM) process. (S22 - Q4b OR, 04)
11. Explain with sketch vacuum-bag moulding process. Give advantages and limitations of it. (S24 - Q5c, 07; W22 - Q5c OR, 07)
12. Write the desired properties of Matrix. (W22 - Q5b, 04)
13. List the functions of matrix in composite materials. (W24 - Q5a, 03)
14. Explain the soda lime glass in detail. (W24 - Q5c, 07)
15. Explain vacuum-bag moulding process with required diagram. (W24 - Q5c OR, 07)
