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**Question Paper Code : X20814**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020  
AND APRIL/MAY 2021  
Sixth Semester

Mechanical Engineering

ME 6004 – UNCONVENTIONAL MACHINING PROCESSES

(Common to Mechanical and Automation Engineering Production Engineering)  
(Regulations 2013)

(Also common to PTME 6004 – Unconventional Machining Processes for  
B.E. Part-time – Sixth Semester – Mechanical Engineering – Regulations 2014)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions.

PART – A

(10×2=20 Marks)

1. State the importance of unconventional machining process.
2. List down the various mechanical energy based on unconventional machining process.
3. Why abrasive jet machining is not recommended to machine ductile materials ?
4. Mention the functions of a horn in ultrasonic machining.
5. Distinguish between electric discharge machining and wire cut electric discharge machining.
6. What is overcutting in electric discharge machining process ?
7. Distinguish between Electrochemical machining and electroplating process.
8. Define Maskants in Electrochemical machining process.
9. What is meant by Plasma ?
10. What is the advantage of EBM over LBM ?

PART – B

(5×13=65 Marks)

11. a) i) List the basic limitations of conventional manufacturing process. Justify the need of unconventional manufacturing process in today's industries. (5)  
ii) Explain the classification of unconventional machining processes according to major energy source employed. (8)

(OR)



- b) i) Mention the best suited Unconventional machining process for the following operations : (4)
- 1) For producing microholes.
  - 2) For machining small holes.
  - 3) For machining deep holes.
  - 4) For producing shallow holes.
  - 5) For precision through cavities in work pieces.
  - 6) For grinding operation.
  - 7) For honing operation.
  - 8) For Deburring operation.
  - 9) For Threading operation.
- ii) How will you analyze the applicability of different processes to different materials, namely metals, alloys and non-metals ? Presentation in the form of a table is preferred. (9)

12. a) Describe the apparatus, process parameters, process capabilities and applications of Abrasive-water Jet machining.

(OR)

- b) i) Explain the principle and working of Ultrasonic machining process.  
ii) Discuss on the transducers and abrasives used in USM.

13. a) i) Sketch and explain of metal removal in EDM process. (6)  
ii) Discuss briefly the types of spark erosion generators. (7)

(OR)

b) Explain the working of wire EDM. How stratified wire works ?

14. a) i) List out the advantages of ECG over conventional grinding. (8)  
ii) Describe the chemistry involved in ECM process. (5)

(OR)

b) Explain in detail the ECM process with neat sketch and also mention the advantages and applications.

15. a) Explain with a neat sketch the principle, construction and working of Electron beam machining process and list its advantages, disadvantages and applications.

(OR)



- b) i) What is LASER ? Explain how it is used to machine the materials. **(6)**
- ii) Discuss the factors that influence the quality of the cut in Plasma arc Machining Process. **(7)**

**PART – C**

**(1×15=15 Marks)**

16. a) You are a manufacturing engineer employed by a tool making company whose main business is in sub-contract manufacture of a wide range of tools used in the injection moulding and forging industries. There is also a specialist division, machining small batches of precision components for the aerospace industry. Component workpiece materials include tool steels, high duty alloys and a range of sintered materials, nonferrous materials stainless steels and ceramics. The existing manufacturing facility include all the usual conventional machine tools including a number of standalone CNC multi-tool machining centres. Your Managing Director, through his trade association and by glancing through technical journals is aware that competitors of the company are introducing non-conventional manufacturing processes to their facilities. You have been requested to submit a brief report covering the following issues :
- i) What is meant by the term non-conventional manufacturing processes ?
  - ii) How do non-conventional processes compare with the company's existing process facilities in respect to : Feature capability, Surface finish, Surface integrity, Material removal rate, Tool wear, Environmental issues and skill requirements ?
  - iii) What particular non-conventional process might be suitable for the company's current product portfolio ?

**(OR)**

- b) How will you decide to recommend specific advanced machining processes for i) cutting a glass plate into two pieces, ii) making a hole in a mild steel workpiece.
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