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**Question Paper Code : 53281**

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Sixth Semester

Mechanical Engineering

ME 6004 – UNCONVENTIONAL MACHINING PROCESSES

(Common to Mechanical and Automation Engineering/Production Engineering)

(Regulation 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish between traditional and nontraditional machining processes.
2. Why conventional mechanical machining process is not so effective on soft metals like aluminium?
3. What are the process parameters affecting the material removal rate in abrasive jet machining?
4. Name the different abrasives used in abrasive jet machining process.
5. Distinguish between electric discharge machining and Wire cut electric discharge machining.
6. What is overcutting in electric discharge machining process and how it is affected by amperage and frequency?
7. What is the use of maskant in chemical machining?
8. Compare electro chemical grinding with conventional grinding.
9. Why electron beam machining is performed in a vacuum chamber?
10. Distinguish between transferred arc and non-transferred arc in plasma arc machining.

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) Write short notes on the following: (i) Transducers used in USM machine, (ii) Effect of amplitude of vibration, frequency of vibration, grain size, and % of abrasive concentration, on MRR in USM, (iii) Possible effects of use of audible frequency in USM. (iv) Functions of slurry, horn, transducer, and oscillator in USM, (v) Types of abrasives used in USM. (vi) Conventional grinding and USM, (vii) Working principle of USM (show the necessary sketch). (13)

Or

- (b) Describe the following with respect to water jet machining. (i) Equipments, (ii) Process characteristics, (iii) Process performance and (iv) Applications (v) Schematic diagram. (13)

13. (a) Why stratified wire is used in wire electric discharge machining? Explain working principle of wire electric discharge machining with simple sketch and discuss its various elements. (13)

Or

- (b) What is normal and reverse polarity in electric discharge machining? With neat sketch explain the various methods of dielectric flushing in electric discharge machining. (13)
14. (a) With neat sketch explain the principle of operation of the electro-chemical machining process. What are the characteristics of electrolyte used in electro chemical machining process? (13)

Or

- (b) Explain the principle of electrochemical grinding with neat sketch. State the process capabilities and applications. (13)
15. (a) Explain with a neat sketch, the working principle of laser beam machining process and state its applications. (13)

Or

- (b) Describe electron beam machining process with a simple sketch and write about its process parameters, advantage and applications. (13)

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?