

Answer the following questions

Question 1: (20 marks / 2 marks per statement)

Select the proper non-traditional process to fulfill the corresponding statements (The answer in the form 01- Process Name)

Statement	Process
01- Nontraditional process removes metal such as the metallic bonds of the molecular structure of the surface are broken, then the surface atoms go into solution as metal ions	
02- Nontraditional process removes workpiece material with an outside source of vibrating energy coupled to the standard tool holders used in traditional machining processes	
03- Nontraditional process removes workpiece material and produces a narrow kerf by the cutting action of a fine, high pressure, high velocity stream of water or water-based fluid with additives	
04- Nontraditional process removes workpiece material with direct contact to the workpiece with rotating tool at high speed and vibrating at high frequency in line with its longitudinal axis	HDM USM RUM
05- Nontraditional process in which the metal removal rate depends on abrasive grain size and slurry concentration	UAM ECM
06- Nontraditional process employs electrical energy to generate thermal energy for removing material, by means of pulsating stream of high-speed electrons concentrate on a very small area of the workpiece surface	ECG EBM EDM
07- Nontraditional process removes metal in the form of hollow spheres of metal or chips by a series of rapidly recurring electrical discharge between the tool and the Workpiece	
08- Nontraditional process uses surface active agent to eliminate passive regions due to hydrogen produced at the cathode	
09- Nontraditional process removes workpiece material and an exact shape is imparted to the workpiece surface via the cutting action of an abrasive slurry that is driven by tool vibrating at high frequency in line with its longitudinal axis	
10- Nontraditional process employs the combined actions of electrochemical attack and abrasion to rapidly remove metal from hard and tough workpiece materials	

Question 2: (10 marks / one mark each)

Answer the following statements with (Yes) or (No):

- 01- From practical experience of HDM, brittle materials such as glass do not appear suitable.
- 02- HDM operations are affected only by nozzle size, water pressure, and standoff distance.
- 03- In USM operation, the metal removal rate depends on the abrasive grain size and slurry concentration.
- 04- In USM, materials that tend to brittle fracture are not the best to be machined.
- 05- The axial ultrasonic vibration in RUM provides faster and smoother drilling, while the tool life is decreased.
- 06- The axial ultrasonic vibration in RUM provides faster and smoother drilling, while the tool life is not affected.
- 07- In ECM, an effective and efficient electrolyte should have good thermal conductivity.
- 08- In ECM, activators agent is to assist in complete wetting of the electrodes.
- 09- ECM and ECG processes are with the same operating principles, except that ECG employs a rotating grinding wheel.
- 10- EBM is based on the conversion of electrical energy into light energy and then to thermal energy.

Answer Q 3: (20 marks / 5 marks for each item)

Compare between the Electrochemical machining (ECM) and the Electrical Discharge machining (EDM) considering only the items; 1) the primary source of energy for metal removal, 2) operation principles, 3) most common fluid, and 4) tool material.

Question 4: (20 marks)

- Re-draw with neat sketches the following non-traditional methods (3 marks each), then name each figure (2 marks each).
- A hole with diameter-to-depth ratio of 1:15 is required to be machined to ceramic workpiece, select the suitable method from the three figures 1, 2 and 3 (5 marks).

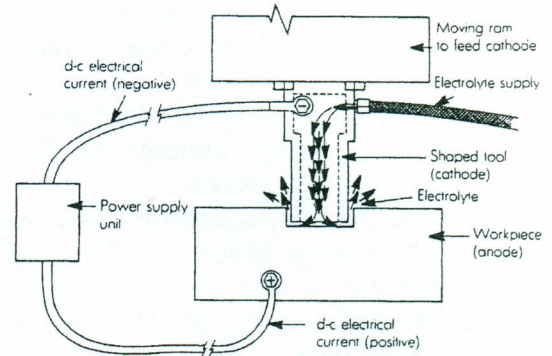


Figure 1

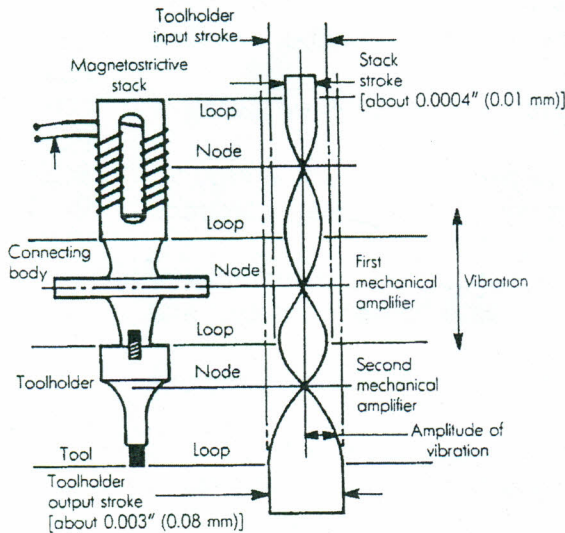


Figure 2

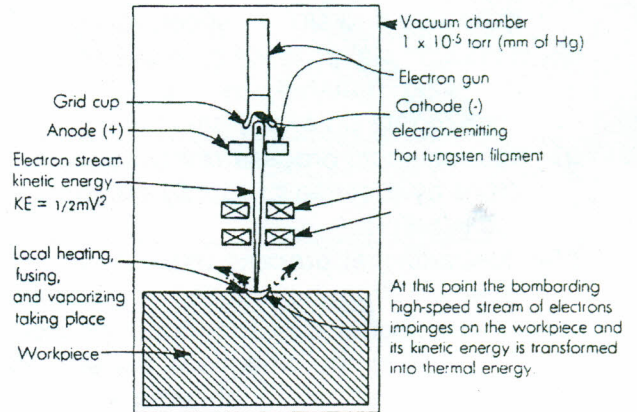


Figure 3

مع أطيب التمنيات بالتوفيق