**2014**
**B.E. (Mechanical Engineering)**
**Sixth Semester**
**MEC-606: Advanced Manufacturing Techniques**

Time allowed: 3 Hours                                              Max. Marks: 50

**NOTE:** *Attempt five questions in all, including Question No. 1 (Part-A) which is compulsory and selecting two questions each from Part B-C. Use of calculator is allowed. Assume missing data if necessary.*

x-x-x

## Part – A

1   a   Why hybrid machining process is important? Write its name also.                    2
    b   $CO_2$ gas can be used in EDM? Give reason.                                          2
    c   Write conditions for formation of plasma.                                           2
    d   Write working principle of transducer in USM.                                       2
    e   How ECG is different from ECM?                                                      2

## Part - B

2   a   State parameters and principle of material removal in abrasive water jet machining.   5

    b   Estimate the MRR in AJM of a brittle material with flow strength of 4 GPA. The abrasive flow rate is 2 gm/min, velocity is 200m/s, density of abrasive is 3 gm/sec.                                                                                  5

3   a   Define EDM process parameters.                                                      5

    b   What is the effect of alkaline solution on material removal rate and surface characteristics in CHM?   5

4   a   What are the important factors for tool design (workpiece and tool) in ECHM?        5

    b   Electrochemical machining of iron with a copper electrode working in NaCl solution in water, calculate the maximum removal rate if current density is allowed 150 amp/cm$^2$, density of iron 7.86 gm/cm$^3$.   5

## Part – C

5   Find out the approximate time required to machine a hole of diameter equal to 6.0 mm in a tungsten carbide plate (Flow strength of work material = $6.9 \times 10^9$ N/m$^2$) of thickness equal to one and half times 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= $1.5 \times 10^9$ N/m$^2$. The slurry contains one part of abrasives to one part of water. Take the values of different constant as K1= 0.3, K2 = $1.8 \times 10^{-6}$ (In SI units) and K3= 0.6 and abrasive slurry density = 3.8 g/cm$^3$. Also calculate the ratio of the volume removed by throwing mechanism to the volume removed by hammering mechanism.   10

6   Electrochemical machining is performed to remove material from an iron surface of 20 x 20 mm under the following conditions: -   10
    Inter electrode gap = 0.2mm
    Supply voltage (DC) = 12 V
    Specific resistance of electrolyte = 2Ω-cm
    Atomic weight of iron = 55.85
    Valency of iron = 2
    Faradays constant = 96540Couloumbs
    Calculate material removed rate (in g/s).

7   What is rotary pulse generator? Explain its working with neat sketch.                   10

x-x-x