

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT  
T1- EXAMINATION (September - 2016)  
M. Tech. (I- SEM.)

COURSE CODE: 14M31CE113  
COURSE NAME: Water Supply and Treatment  
COURSE CREDIT: 3

MAX. MARKS: 15  
MAX. TIME: 1 HRS

*Note: Attempt all questions. Assume suitable data if required. Carrying of mobile phone during examinations will be treated as case of unfair means*

1. Plot the species distribution curve for  $\text{H}_3\text{PO}_4$  given  $K_1 = 7.0 \times 10^{-3}$ ,  $K_2 = 6.5 \times 10^{-8}$ ,  $K_3 = 5 \times 10^{-13}$  and  $\text{p}K_1 = 2.15$ ,  $\text{p}K_2 = 7.18$ ,  $\text{p}K_3 = 12.30$ . Take 4 values in acidic range, 4 values in alkaline range and at neutral conditions. (Total 9 points to be plotted). Make a tabular format to show the variation in species distribution. Explain the conclusions drawn from the species distribution plot. (8)
2. Calculate the  $[\text{H}^+]$  concentration in a 0.75M acetic acid solution given  $K_a = 2 \times 10^{-5}$ . Also find the  $[\text{H}^+]$  concentration if 0.5 M solution of sodium acetate is added to the solution. Determine the fraction of decrease in the  $[\text{H}^+]$  ion concentration (3)
3. Calculate  $\text{H}^+$ ,  $\text{HS}^-$  and  $\text{S}^{2-}$  concentrations in a solution prepared by dissolving 0.5 moles of  $\text{H}_2\text{S}$  and 0.8 moles of  $\text{HCl}$  in water to produce 1.0 liter of solution. Given  $K_1 = 1.4 \times 10^{-7}$  and  $K_2 = 1.2 \times 10^{-14}$  (2)
4. With a neat sketch where appropriate, briefly explain (a) Bronsted-Lowry concept and (b) Lewis concept of acids (2)