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Code No. : 01/302

Roll No.....

Total No. of Units : 04

Total No. of Printed Pages : 04

**Unit - IV**

Q.4 A. What is Michaelis-Menten equation? (2)

Q.4 B. Predict the effect of ionic strength on the rates of following reactions (justify your answers) (2)

(i) Products.

(ii) Products.

Q.4 C. What are fast reactions? Discuss the flash photolysis method for the study of fast reaction. (4)

**OR**

The value of specific rate constant for the decomposition of nitrogen pentoxide is  $3.46 \times 10^{-5}$  at  $25^\circ\text{C}$  and at  $65^\circ\text{C}$ . Calculate the energy of activation and Arrhenius factor for the reaction.

Q.4 D. What are the limitations of collision theory? Describe activated complex theory of reaction rates and discuss the significance of activation parameters. (12)

**OR**

Mention the difference between thermal and photochemical reaction. Discuss the mechanism of photochemical combination between hydrogen and bromine and derive the rate law for the reaction.

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**First Semester Examination, Dec. 2018****M.Sc. CHEMISTRY****Paper - III**

**MATHEMATICS FOR CHEMISTS, QUANTUM  
CHEMISTRY & CHEMICAL DYNAMICS**

**Time : 3 Hrs.****Max. Marks : 80**

- Part A and B of each question in each unit consist of very short answer type questions which are to be answered in one or two sentences.

Part C (Short answer type) of each question will be answered in 200-250

words.  
 $\frac{d}{dx} [3x^2 - 1] = 6x$   
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Part D (Long answer type) of each question should be answered within the word limit 400-450.

**Unit - I**

Q.1 A. If \_\_\_\_\_ and \_\_\_\_\_ find a.b and a x b. (2)

Q.1 B. Solve : (2)

Q.1 C. Find the determinant : (4)

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**OR**

Find the value of and

Q.1 D. If, then at the point (1, -1, 1) find (12)

(i) Div  $f$  and Curl  $f$

**OR**

(i) Find the maximum and minimum values for

(ii) Solve the following integral and find 'k'

### Unit - II

Q.2 A. Write the operator for kinetic energy and total energy. Also give Eigen value equation & its significance. (2)

Q.2 B. What is perturbation theory? What is perturbation term for Helium atom? (2)

Q.2 C. Write the expression for Hydrogen atom in terms of polar coordinate, R- equation, - equation and - equation. Solve - equation. (4)

**OR**

Obtain the asymptotic solution for the ground state of simple harmonic oscillator and show how we can establish the expression for vibrational energy of simple harmonic oscillator from Recursion formula.

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Q.2 D. State Variation theorem and discuss the application of variation method to hydrogen atom. (12)

**OR**

Solve schrodinger wave equation for a particle in 3 D-box and discuss the concept of degeneracy. What is the degeneracy of an energy state with ?

### Unit - III

Q.3 A. Give the generalized definition of angular momentum and write the operator for angular momentum components in polar coordinate. (2)

Q.3 B. Find the commutator for the following :  $[L_x, L_y]$  (2)

Q.3 C. Find the possible values of eigen values of angular momentum component  $L_z$ . (4)

**OR**

What is meant by symmetric & antisymmetric wavefunction with respect to spin?

Q.3 D. What is meant by step-up and step down operator? Explain Ladder operator and its application. (12)

**OR**

Discuss the application of Huckel MOT to buta-1,3 diene and determine the - bond energy.

**P.T.O.**