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Total Number of Pages : 2

AR-19

B.TECH 1<sup>ST</sup> SEMESTER EXAMINATIONS (REGULAR), NOV/DEC 2019

BBSBS1022 – ENGINEERING CHEMISTRY

Time : 3 Hours

Maximum : 70 Marks

Answer ALL Questions

The figures in the right hand margin indicate marks.

**PART – A: (Multiple Choice Questions) 10 × 1=10 Mark**

Q 1. Answer all questions (Choose the correct answer)

- a.  $\Psi$  is significant when it is CO1PO1  
a) Multi valued, continuous, finite      b) Single valued, continuous, finite  
c) Multi valued, discontinuous, finite      d) single valued, continuous, infinite
- b. Hamiltonian operator is the operator of CO1PO1  
a) Total energy,    b) Kinetic energy,    c) Potential energy,    d) Momentum
- c. Why de-Broglie wave associated with a car is not observable? CO1PO1  
a)  $\lambda$  is directly proportional to mass      b)  $\lambda$  is inversely proportional to mass  
c)  $\lambda$  is not related to mass      d)  $\lambda$  is proportional to square of mass
- d. Hardness of water is expressed in terms of CO2PO1  
a)  $\text{Ca}(\text{HCO}_3)_2$  equivalent    b)  $\text{CaCO}_3$  equivalent  
c)  $\text{CaSO}_4$  equivalent    d)  $\text{MgSO}_4$  equivalent
- e. Identify the water softening method (s) CO2PO1  
a) Lime-soda process    b) zeolite process    c) De-ionization    d) All of these
- f. Identify the incorrect statement: CO2PO1  
a) the electrode with less  $E^0_{\text{el}}$  (reduction) acts as anode.  
b) corrosion occurs at anode .  
c) corrosion is more intense with large anode and small cathode.  
d) Zn is used as anodic coating for Iron.
- g. The metal oxide layer will be protective when it is CO3PO1  
a) volatile    b) porous    c) stable    d) more thick
- h. The process of coating of container for food materials should be CO3PO1  
a) galvanizing    b) Tinning    c) moulding    d) all of these
- i. Polystyrene is CO4PO1  
a) addition polymer    b) condensation polymer    c) conducting polymer    d) bio-polymer
- j. Polyester is CO4PO1  
a) addition polymer    b) condensation polymer    c) conducting polymer    d) bio-polymer

**PART B (short answer type questions) 10x2=20 marks**

Q 2. Answer all questions:

- a. Write down Schrodinger three dimensional wave equation. Write down the symbols used in it CO1PO1
- b.  $\text{He}_2$  molecule does not exist. Explain by using molecular orbital theory. CO1PO1
- c. At what condition the wave length associated with a proton would be  $1/10^{\text{th}}$  of that of an electron? CO1PO2
- d. What happens to hard water when lime is added to it. CO2PO1
- e. What is hardness of water? What are the salts responsible for temporary and permanent hardness of water? CO2PO1
- f. Explain the water line corrosion. CO2PO1



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|----|---|--------|
| g. | Why does the part of a nail inside the wood undergo corrosion easily?         | CO3PO1 |
| h. | Differentiate between addition and condensation polymerization with examples. | CO4PO1 |
| i. | Differentiate between thermoplastic polymers and thermosetting polymers.      | CO4PO1 |
| j. | What is tacticity? Explain with examples.                                     | CO4PO1 |

**Part-C Long Answer Questions (4x10=40 marks)**

Answer all questions

- Q3.
- |   |  |   |        |
|---|--|---|--------|
| a | Find the solution of the Schrödinger's wave equation for a particle in an infinite One Dimensional box with zero potential energy inside the box | 6 | CO1PO2 |
| b | Normalize the wave function.   | 4 | CO1PO2 |

OR

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|------|---|---|--------|
| c    | By using molecular orbital theory, compare the bond dissociation energy, bond length and magnetic properties of $O_2$ , $O_2^-$ , $O_2^{2-}$ , $O_2^+$  | 7 | CO1PO2 |
| d    | Find the wave length of radiation emitted by an electron in a 1-D box of length $2\text{\AA}$ which drops from quantum level $n = 2$ to $n = 1$ .   | 3 | CO1PO2 |
| Q4.a | Explain the different methods of softening of water by lime soda process.   | 6 | CO2PO1 |
| b    | 50 ml of a water sample consumed 20 ml of 0.01 M EDTA before boiling and 12 ml of the same EDTA after boiling. Calculate the degree of total hardness, permanent hardness and temporary hardness of the water sample. | 4 | CO2PO2 |

OR

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|------|---|---|--------|
| c    | What are ion exchange resins? Describe their application in water softening. Write down the advantages and disadvantages of this process. How are spent resins regenerated?   | 6 | CO2PO1 |
| d    | Calculate the quantity of lime and soda required for softening 80,000 litres of water containing $Ca(HCO_3)_2 = 10\text{ mg/L}$ , $Mg(HCO_3)_2 = 8\text{ mg/L}$ , $CaSO_4 = 15\text{ mg/L}$ , $MgSO_4$  | 4 | CO2PO2 |
| Q5.a | Describe the mechanism of electrochemical corrosion in rusting of Iron.   | 5 | CO3PO1 |
| b    | Write down the cell reaction and Calculate the $E^0_{\text{cell}}$ , $E_{\text{cell}}$ and $K_{\text{eq}}$ of the cell $Zn/Zn^{+2} (0.1M) // Fe^{2+} (0.05M)/Fe$ , given that $E^0_{(Zn^{+2}/Zn)} = -0.76\text{ V}$ , $E^0_{(Fe^{+2}/Fe)} = -0.45\text{ V}$ . | 5 | CO3PO2 |

OR

- |     |  |   |        |
|-----|--|---|--------|
| c   | Describe the factors that affect corrosion with suitable examples.                       | 5 | CO3PO1 |
| d   | Explain the methods of control of corrosion.   | 5 | CO3PO1 |
| Q6. | How will you synthesize nylon 6:6 from 1, 3-butadiene? Write down the uses of nylon 6:6. | 6 | CO4PO1 |
| a   | How it is different from nylon-6.  |   |        |
| b   | Write short notes on biopolymers.  | 4 | CO4PO1 |

OR

- |   |  |   |        |
|---|--|---|--------|
| c | What is conducting polymer. Discuss different types of conducting polymers with at least two examples from each. | 5 | CO4PO1 |
| d | Discuss the preparation, properties and uses of bakelite and PVC.  | 5 | CO4PO1 |