

P. Pages : 2

Time : Three Hours



AW - 3513

Max. Marks : 80

- Notes :
1. Due credit will be given to neatness and adequate dimensions.
  2. Assume suitable data wherever necessary.
  3. Diagrams and chemical equations should be given wherever necessary.
  4. Illustrate your answer necessary with the help of neat sketches.
  5. Discuss the reaction, mechanism wherever necessary.
  6. Use of pen Blue/Black ink/refill only for writing the answer book.

## SECTION - A

1. For irreversible exothermic catalytic reaction, 14  
 if  $\frac{dC_{PA}}{dt} = k_1 C_N + k_3 C_{NQ} - k_4 C_{PA}$   
 then prove that;

$$C = \frac{k_1 [k_4 - 2k_3]}{[k_4 - 2k_1] [k_4 - k_3]}$$

Here phthalic anhydride is considered as a main product.

OR

2. Calculate the value of  $C_N$ ,  $C_{NQ}$  and  $C_{PA}$  at temperature 593, 600 and 643°K. 14  
 Assume : i) residence time = 0.2 second  
 ii) Initial concentration of  $C_N$ ,  $C_{NO} = 1\%$ .
3. How to achieved the optimum operating conditions for phthalic anhydride synthesis? 13  
 Discuss it by considering some true values of temperature and time. Explain by graphical method.

OR

4. Prove that, 'Adsorption is one of the efficient technique for separation of  $C_2$  fraction into individual constituents'. 13
5. What are the important process parameter to be considered in steam cracking process? 13  
 Discuss in brief.

OR

6. Discuss following in brief: 13  
 i) Importance of simplified reaction scheme in mathematical modeling.  
 ii) Role of splitter in steam cracking.  
 iii) Best feed for ethylene and acetylene synthesis by steam cracking.

7. Give critical account of coal gasification. What are the different processes available for coal gasification? Give comparative data with respect to 14
- Type of feed
  - Operating conditions
  - Product pattern for all type of processes

OR

8. Feed for shift convertor having following composition; 14
- $H_2 = 34.9$  mole,  
 $CO = 7.2$  mole,  
 $CO_2 = 5.4$  mole,  
 90% conversion of CO is required. Select the best operating temperature from following.  
 $1250.7^\circ K$  ( $K = 65.7$ )  
 $1048^\circ K$  ( $K = 1.192$ )  
 $1231.95^\circ K$  ( $K = 47.685$ )

9. Calculate the yield in case of reversible exothermic reaction for time 0.5 minute at temperature 80, 90 and  $100^\circ C$ . Assume  $\Delta G = -10,000$  J / mole at  $298^\circ K$ . 13
- $\Delta H = -40,000$  J / mole (It is constant over the temp. range  $273-573^\circ K$ )  
 $K = 10^9 e^{-60,000/RT} \text{ min}^{-1}$

OR

10. If  $A \rightleftharpoons B$  is a reversible exothermic reaction. The prove that 'for each reaction time there is an individual maxima'. 13
11. What are the factors which affect the operating conditions for ammonia synthesis? Discuss in brief. Which one is the best suitable operating conditions for ammonia synthesis to optimize the yield. 13

OR

12. Name the various techniques available for acetylene synthesis with basic principle involved. Discuss any one in brief. 13

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