B.TECH SEM – VII (2007 COURSE) (CHEMICAL ENGG.) : SUMMER - 2018

SUBJECT: CHEMICAL REACTION ENGINEERING-II

Day :	**Monday**	**S-2018-2748**	Time : **02.30 PM TO 05.30 PM**
Date :	**21/05/2018**		Max. Marks: 80

N. B. :

1) **Q. No.1** and **Q. No.5** are **COMPULSORY.** Out of the remaining attempt **ANY TWO** questions from each section.
2) Answer the both the sections should be written in the **SEPARATE** answer book.
3) Figures to the right indicate **FULL** marks.
4) Assume suitable data if necessary.

SECTION-I

Q.1 **a)** Analyze steps involved in developing overall rate equation for heterogeneous reactions. **(05)**

b) Compare progressive and unreacted core model. **(05)**

c) Give steps involved in catalytic reactions. **(04)**

Q.2 **a)** Draw contacting patterns for heterogeneous reaction system. **(07)**

b) What is mean by linearizing a nonlinear rate expression? **(06)**

Q.3 **a)** A feed consisting of 30% of 50 μm radius particles, 40% of 100 μm radius particles, 30% of 200μm radius particles is to be fed continuously in a thin layer onto a moving grate, crosscurrent to a flow of reactant gas. For the planned operating conditions the time required for complete conversion is 5, 10 and 20 min for the three sizes of particles. Find the conversion of solids on the grate for a resistance time of 8 min in the reactor. **(10)**

b) Write different types of heterogeneous reaction used in industry. **(03)**

Q.4 **a)** Elaborate types of adsorption in detail. **(07)**

b) Discuss preparation of catalyst for the heterogeneous reactions. **(06)**

SECTION-II

Q.5 **a)** Draw kinetic regimes for mass transfer and reaction. **(06)**

b) Explain E and F curve. **(05)**

c) Define and explain overall effectiveness factor. **(03)**

Q.6 The concentration of undesirable impurity in air at 1 bar is to be reduced from 0.1% to 0.02% by absorption with high concentration of reactant B, $C_{B1} = 800$ mol/m^3 **(13)**

Data:

$k_{Ag}a = 0.32$ mol/hr.m^3.Pa.

$k_{Al}a = 0.1$/hr.

The solubility of A in water is given by Henry's law constant.

$H_A = 12.5$ Pa.m^3/mol.

$F_g/A_{cs} = 1 \times 10^5$ mol/hr m^2

$F_l/A_{cs} = 7 \times 10^5$ mol/hr m^2

$C_T = 56000$ mol/m^3

Assume diffusivities of A and B in water is same. Calculate height of tower for the crosscurrent operation.

Q.7 **a)** Discuss role of RTD in determining reactor behavior. **(06)**

b) Give details of step and pulse experiment. **(07)**

Q.8 **a)** Derive equation for overall effectiveness factor for diffusion and reaction in spherical catalyst pellet. **(09)**

b) Write on CVD. **(04)**

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