Q (A) (a) TE/IV/CBSGS/CET-II

$K = K_y p^r = K_y p^r$

$$1.1067 \times 10^{-5} = \frac{\left(\frac{0.3+2\varepsilon}{6.3-2\varepsilon}\right)^2 \times 100^{-2}}{\frac{(1-\varepsilon)}{(6.3-2\varepsilon)}\left(\frac{5-3\varepsilon}{6.3-2\varepsilon}\right)^3}$$

$\varepsilon = 0.1177$

fraction of N_2 reacted $= 0.1177$
$= 11.77\%$

(5) Heat duty $= Q = 339.18 \times 10^4$ KJ

$COP_{carnot} = 6.97$

$COP_{actual} = 2.324$

$W = 418.7$ KJ/min $\therefore Q_2 = 9760.8$

capacity $= 46.48$ Tons

time $= 348$ min $= 6$ hrs

TE/V/CBSGS/CET-II

Q(2)(1) $P = \sum x_i P_i^S = \sum x_i e^{A_i - \frac{B_i}{t+c_i}}$

$P = x_1 P_1^S + x_2 P_2^S \; x_3 P_3^S$

Solve 't' by trial & error

Ans: $t = 68.90^\circ C$, for $P = 80$ KPa

$y_1 = 0.5196$, $y_2 = 0.3773$

$y_3 = 0.1030$

(ii) Ily for $P = 90$ KPa

$$\sum P \frac{y_i}{e^{A_i - \frac{B_i}{t+c_i}}} = 1$$

at $P = 90$ KPa $t = 73.95^\circ C$

$x_1 = 0.3303$, $x_2 = 0.2240$, $x_3 = 0.4457$

Q(3)(b) $V^E = 0.375$ at $x_1 = 0.5$

$\frac{\partial V^E}{\partial x_1} = 1 - 3x_1^2$

$\bar{V}_1^\circ = 0.62 \; m^3/Kmol$ $\bar{V}_2 = 0.4 \; \frac{m^3}{Kmol}$

$V_{total} = 0.51 \; m^3$

Q(4)(b) $V = 4$