

大同大學 100 學年度 (寒) 轉學入學考試試題

考試科目：工程數學

所別：化學工程學系

第 頁

註：本次考試 不可以參考自己的書籍及筆記； 不可以使用字典； 不可以使用計算機

請在答案卷上詳列所有計算過程，如果你認為無法用學過的方法解，請詳述原因即可。

1. (15%) Solve $2x - y \sin(xy) + (3y^2 - x \sin(xy))y' = 0$.

2. (15%) Solve $y' + \frac{2}{x+1}y = 3$; $y(0) = 5$

3. (15%) Solve $y'' - 3y' = 2e^{2x}\sin(x)$; $y(0) = 1$, $y'(0) = 2$.

4. (20%) Solve the differential equation with the hint.

$$4x^2y'' + 8xy' + (4x^2 - 35)y = 0; u = y\sqrt{x}$$

5. (20%) A 400-L tank initially contains 200 liter of NaOH solution in which 10 kg of NaOH have been dissolved. Beginning at time zero, a NaOH solution containing 1 kg of NaOH per liter is added at the rate of 10 liter per minute, and a different stream containing pure water only is also added at the rate of 10 liter per minute. Meanwhile, another stream is poured out of the tank at the rate of 20 liter per minute. At just four minutes after time zero, 20 kg of pure NaOH is dumped into tank at the moment. Determine how much NaOH is in the tank at any time?

6. (15%) Find the temperature distribution in a thin and homogeneous bar of length 25 cm has both insulated ends and initial temperature is 315 K. Assume one dimensional heat transfer and the heat coefficient k equals to 0.01 with suitable unit.