逢甲大學101學年度碩士班招生考試試題 編號：050 科目代碼：

科目	工程數學與流體力學	適用系所	環境工程與科學學系A組	時間	100 分鐘

※請務必在答案卷作答區內作答。

A.工程數學部分：

1. Verify by direct substitution that $y_1 = e^{px}\cos qx$ and $y_2 = e^{px}\sin qx$ are solutions of the equation $y'' - 2py' + (p^2 + q^2)y = 0$. (10%)
2. Find an integrating factor for the equation $xdy - ydx = (4x^2 + y^2)dy$, and solve the equation. (10%)
3. If the Laplace transform of $y(t)$ is $\mathscr{L}(y) = \dfrac{s+1}{s^2 + s - 6}$, please use the method of partial fractions to find $y(t)$. (10%)
4. Solve the linear differential equation $y' - y = e^{2x}$. (10%)
5. Solve the initial value problem $y' - y\tan x = \sin 2x, \quad y(0) = 1$. (10%)

B.流體力學部分:

6. Water flows in a 3-ft-diameter concrete pipe (n=0.015, s=0.002). What are the velocity and depth when the flowrate is 24.6 cfs? Mark your decision on Fig.1 (10%)
7. Water flows in a horizontal rectangular channel (2m wide, n=0.015) as shown in Fig.2. The observed depths before and after a hydraulic jump are 0.25m and 1.0m, respectively. Find the flowrate, the head loss, and the jumping location, L. (15%)
8. List and explain all you know about the characteristics of critical flow in an open channel. How is this concept (critical flow) applied to a Parshall flume? (10%)
9. Calculate the time needed to entirely drain a container through a hole 20×20cm at the bottom. The cross section of the container is a square with 4m in each side. Original height of water is 4 m. Neglect all friction and contraction effects. (15%)

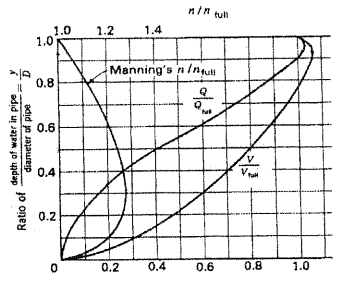

Fig.1

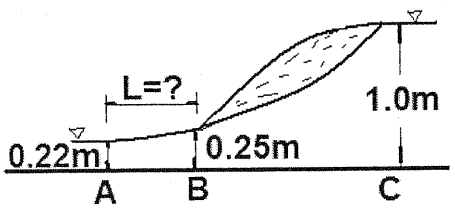

Fig.2