

逢甲大學 95 學年度轉學生招生考試試題

科目	工程數學	適用系別	化工系三年級	時間	80 分鐘
----	------	------	--------	----	-------

1. Use the operator method to find the particular solution of
 (a) $y'' - 3y' + 2y = x e^x$ (b) $y'' - y = e^{-x}$ (20%)

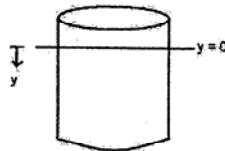
2. Use the method of variation of parameters to find the particular solution of
 $y'' + y = \csc x$ (15%) Note $\csc x = 1/\sin x$

3. Find the power series solution of the given differential equation
 $y' = 2xy$ (15%)

$$A = \begin{pmatrix} 4 & -2 & -2 \\ 1 & -1 & -2 \\ 0 & 2 & 3 \end{pmatrix}$$

4. Given a matrix
 - (a) Find the eigenvalues and eigenvectors of the matrix A. Show the details of your work. (20%)
 - (b) Find the inverse matrix of A. Show the details of your work. (10%)

5. Archimedes's principle states that the buoyancy force equals the weight of the water displaced by the body (partly or totally submerged). The figure below shows a cylindrical buoy of m in mass and 60 cm in diameter, standing in water with its axis vertical. When depressed slightly and released, its period of vibration is 2 sec. Find the weight of the buoy.



- (a) Assume the buoy is depressed from its equilibrium position, $y = 0$ m, to $y = y$ m. What is the volume (m^3) of water displaced by the buoy (expressed in y and π)? (5%)
- (b) Assume $w = 9800$ newton is the weight of water per cubic meter, i.e., $w = 9800 \text{ N/m}^3$, what is the weight (N) of water displaced by the buoy (expressed in y , w , and π)? (2%)
- (c) Since the weight = buoyant force = ma , write down the differential equation of motion, expressed in m , w , π , y'' , and y . (3%)
- (d) From the equation above, find out ω_0^2 , expressed in m , w , and π . (5%)
- (e) Since $2\pi/\omega_0 = 2$ (sec), calculate the weight (N) of the buoy = $mg = 9.8m$. (5%)