國立臺北科技大學

九十四學年度車輛工程系碩士班入學考試

工程數學試題

填准考證號碼

注意事項：

1. 本試題共六題，配分共100分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。

1. Proof: a positive (or negative) definite matrix is always nonsingular. (10 %)

2. Show a symmetric matrix is positive definite if and only if the determinants of all of its leading **principal** minors are positive. (10%)

3. Assume that the input current i_1 and voltage u_1 of the four-terminal network in Fig. 1 are related to the output current i_2 and voltage u_2 according to $v_1 = Tv_2$ where $v_1 = \begin{bmatrix} u_1 \\ i_1 \end{bmatrix}$, $T = \begin{bmatrix} t_{11} & t_{12} \\ t_{21} & t_{22} \end{bmatrix}$, $v_2 = \begin{bmatrix} u_2 \\ i_2 \end{bmatrix}$ and where T is called the transmission matrix of the network. Find the form of T. (20%)

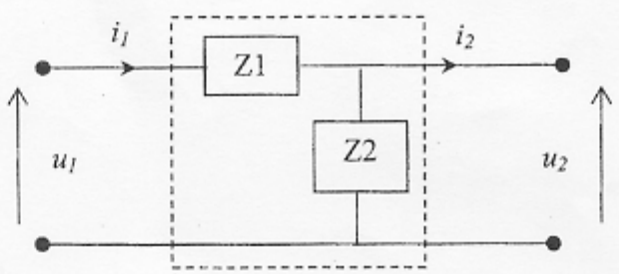

Fig. 1

4. Find the moment of the force P in Fig. 2 about the center of the wheel. (20%)

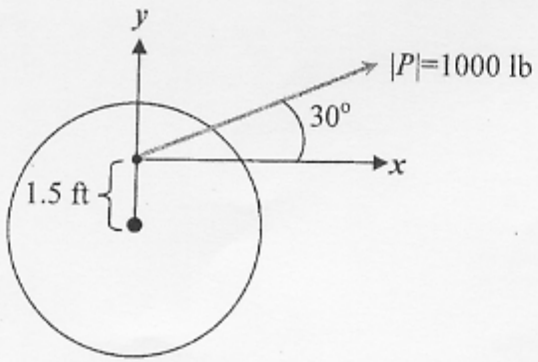

Fig. 2

5. In Fig. 3 shows a series RLC circuit, when t=0 the switch is closed. Find the final solution of voltage e(t). (20%)

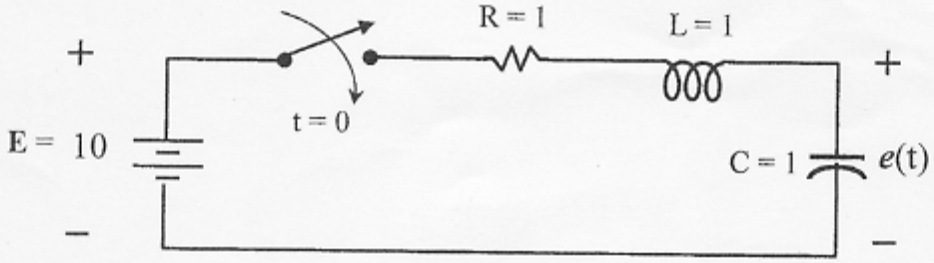

Fig. 3

6. A tank contains 200 gal of water in which 40 lb of salt are dissolved. Five gal of brine, each contains 2 lb of dissolved salt, run into the tank per minute, and the mixture, kept uniform by stirring, runs out at the same rate. Find the amount of salt y(t) in the tank at any time t. (20%)