

大同大學 100 學年度研究所碩士班入學考試試題

考試科目：電路學

所別：電機工程研究所

第1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； 可以使用計算器。

1. (a) Using mesh analysis, find R_{eq} for Fig. 1. (b) Using node analysis, find R_{eq} for Fig. 2. (30%)

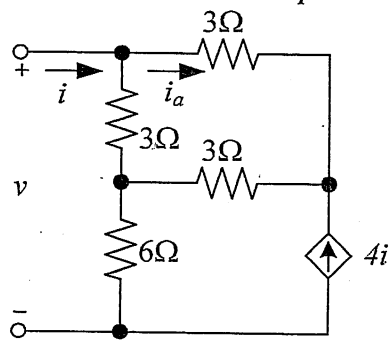


Fig. 1

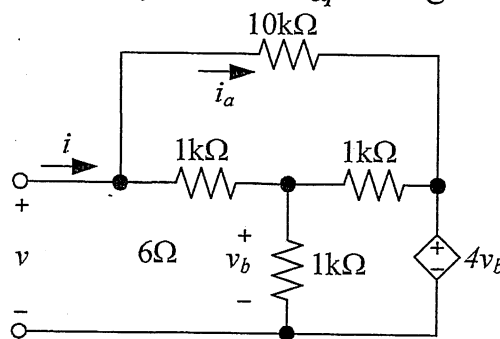


Fig. 2

2. Find the resonant frequency ω_r and the input impedance at ω_r for the circuit of Fig. 3. (15%)

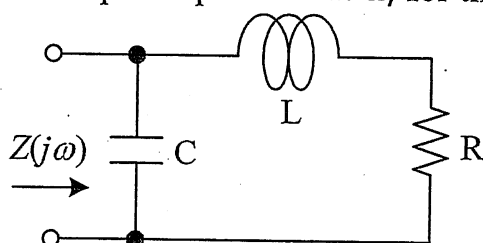


Fig. 3

3. Let the Laplace transform of the velocity of a certain projectile be given by

$$V(s) = \frac{500s + 20}{s(5s + 20)(10s + 1)}$$

with the Laplace transform of the acceleration $a(t)$ given by

$$A(s) = sV(s) - v(0^+) = \frac{500s + 20}{(5s + 20)(10s + 1)}$$

Find (a) the initial velocity $v(0^+)$ and the initial acceleration $a(0^+)$. (b) the final values of $v(t)$ and $a(t)$ if possible. (20%)

4. Three loads are connected in parallel across a single-phase AC source voltage of 240-V (RMS). Load 1 consumes 12 kW and 6.667 kVAR; Load 2 consumes 4 kVA at 0.96 power factor leading; and Load 3 consumes 15 kW at unity power factor. Determine (a) the total real power and reactive power supplied by the source, (b) the current of the source, (c) the equivalent impedance, Z , of the total loads. ($Z=R+jX$) (15%)
5. A balanced three-phase AC circuit is shown in the following figure. Where three identical impedances of $Z=20 \angle 60^\circ \Omega$ are connected in Δ , are supplied by a three-phase source with voltage of 480-V (line-to-line), through three lines with impedance $Z_L=0.8+j0.6\Omega$ per line. Determine (a) the line current, (b) the voltage (line-to-line) at the load terminals. (20%)

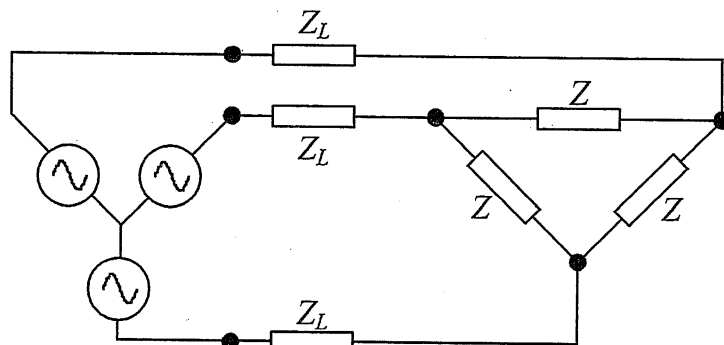


Fig. 4