

國立臺北科技大學

九十三年學年度電機工程系碩士班入學考試

電機機械試題

填准考證號碼

第一頁 共一頁

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注意事項：

1. 本試題共 5 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. A smoothing inductor for large-capacity motors has a winding with 100 turns. The winding resistance is 0.112Ω , and its inductance is $30mH$. If the current in the inductor is $50\sin 377t$, what voltage is produced at the terminals of the inductor?(15 分)

2. Please use the hysteresis curve of the transformer to explain graphically why non-sinusoidal excitation current is needed to generate a sinusoidal voltage at the secondary winding of a transformer. Assume that the core-loss current can be neglected. (15 分)

3. A 50-hp, 250-V, 1200 rpm DC shunt motor with compensating windings has an armature resistance(including the brushes, compensating windings, and interpoles) of 0.06Ω , Its field circuit has a total resistance of 50Ω , which produces a no-load speed of 1200 rpm. There are 1200 turns per pole on the shunt field windings.
 - (a) Find the speed of this motor when its input current is 100 A. (4 分)
 - (b) Find the speed of this motor when its input current is 200 A. (4 分)
 - (c) Find the speed of this motor when its input current is 300 A. (4 分)
 - (d) Plot the torque-speed characteristics of this motor. (8 分)

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4. A 100-MVA, 16-kV, 0.8-PF-lagging Y-connected synchronous generator has a negligible armature resistance and a synchronous reactance of 0.7 per-unit. The generator is connected in parallel with a 60-Hz 16-kV infinite bus that is capable of supplying or consuming any amount of real or reactive power with no change in frequency or terminal voltage.
- What is the synchronous reactance of the generator in ohms? (5 分)
 - What is the internal generated voltage E_A of this generator under rated conditions? (5 分)
 - What is the armature current I_A in this generator at rated conditions? (5 分)
 - Suppose that the generator is initially operated at rated conditions. If the internal generated voltage E_A is decreased by 5 percent, what will the new armature current I_A be? (10 分)
5. A 50-kW, 440-V, 50-Hz, two-pole induction motor has a slip of 6 percent when operating at full-load conditions. At full-load conditions, the friction and windage losses are 520 W, and the core losses are 500 W. Find the following values for full-load conditions:
- The shaft speed n_m . (5 分)
 - The output power in watts. (5 分)
 - The load torque τ_{load} in Newton-meters. (5 分)
 - The induced torque τ_{ind} in Newton-meters. (5 分)
 - The rotor frequency in Hertz. (5 分)