

國立成功大學

112學年度碩士班招生考試試題

編 號： 172

系 所： 電機工程學系

科 目： 電力工程

日 期： 0206

節 次： 第 2 節

備 註： 可使用計算機

※ 考生請注意：本試題可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. (25%) A balanced- Δ load consisting of pure resistances of 15Ω per phase is in parallel with a balanced-Y load having phase impedances of $8 + j6 \Omega$. Identical impedances of $2 + j5 \Omega$ are in each of the three lines connecting the combined loads to a 110-V three-phase supply.
 - (a) (10%) Current drawn from the supply;
 - (b) (10 %) Line voltage at the combined loads;
 - (c) (5%) Draw the power triangle of the combined load.
2. (15%) A short transmission line is connected to a load of 200 kVA at a lagging power factor of 0.866 at 2.4kV. The line impedance is $2.07 + j0.661 \Omega$. Determine:
 - (a) (5%) sending end voltage;
 - (b) (5%) sending end current;
 - (c) (5%) input impedance.
3. (10%) Please use the sinusoidal signal and triangular carrier signal to draw the PWM signal with the following switching pattern:
 - (a) (5%) PWM with bipolar voltage switching;
 - (b) (5%) PWM with the unipolar voltage switching.
4. (12%) Please draw a three-phase voltage source inverter (VSI) composed of six power MOSFETs and the connection to a three-phase RL load. Explain how pulse-width modulation (PWM) is applied to produce a sinusoidal fundamental line-to-line voltage output to the load, taking V_{ab} as an example. Assume that the carrier signal waveform is triangular.
5. (18%) A three-phase, 60-Hz, Y-connected synchronous generator with a rated field current I_F of 5 A was tested, and the following data were taken:
 1. The open-circuit terminal voltage $V_{T,OC}$ at the rated I_F was measured to be 520 V.
 2. The short-circuit line current $I_{L,SC}$ at the rate I_F was found to be 250 A.
 3. When a dc voltage of 20 V was applied to two of the terminals, a current of 40 A was measured.
 - (a) (12%) Determine the value of the armature resistance and the approximate synchronous reactance in ohms that would be used in the generator model at the rated conditions;
 - (b) (6%) Draw the per-phase equivalent circuit of the generator including the field circuit.
6. (20%) A 200-V dc shunt motor with compensating windings has an armature resistance (including the brushes, compensating windings, and inter-poles) of 0.1Ω . Its field circuit has a total resistance of 50Ω , which produces a no-load speed of 1000 r/min. Plot the torque-speed characteristic of this motor by calculation using line current of 150 A and 300 A.