

國立成功大學

113學年度碩士班招生考試試題

編 號： 169

系 所： 電機工程學系

科 目： 電力工程

日 期： 0201

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. Please illustrate the block diagram with the basic functions of a typical switching-mode power supply (SMPS) and explain. (20%)
2. A single-phase AC supply of 120 V_{rms}, 60 Hz supplies a resistive load of 22 Ω through an ideal single-phase, full-wave, full-bridge rectifier. Please calculate (a) the average value of the load current, (b) the maximum value of the load current, and (c) the root-mean-square (RMS) value of the load current. (20%)
3. Two three-phase squirrel cage rotor induction motors (SCRIMs) and a three-phase synchronous motor (SM) are connected to a three-phase, 69 kV, 60 Hz infinite bus through a three-phase transmission line and a three-phase step-up transformer. The first SCRIM consumes 100 MW at a power factor of 0.707 lagging, the second SCRIM consumes 200 MW at a power factor of 0.8 lagging, and the SM consumes 150 MW at a power factor of 0.8 leading. Please solve for (a) the current of the transmission line and (b) the equivalent power factor of the combined load. (20%)
4. A three-phase, 220-V, 60-Hz, 8-pole, 15-hp (1 hp = 746 W) induction motor operated at the rated voltage and frequency has a full-load slip of 5%. Please compute (a) the synchronous speed (rpm), (b) the full-load speed (rpm), (c) the rotor frequency under full-load condition (Hz), and (d) the shaft torque under the rated load (N·m) of the induction motor. (20%)

※ 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。

5. The swing equation of one of the two interconnected synchronous machines (SMs) can be

written as, respectively, $\frac{H_k}{\pi f_0} \frac{d^2 \delta_k}{dt^2} = P_{mk} - P_{ek}$, where H_k , δ_k , P_{mk} , and P_{ek} are the inertia

constant, the power angle, the mechanical input power, and the electromechanical power of the k -th SM, respectively. Please use $\delta = \delta_1 - \delta_2$ as the relative power angle between the two

SMs to obtain the equivalent swing equation $\frac{H}{\pi f_0} \frac{d^2 \delta}{dt^2} = P_m - P_e$ that is equivalent to that of

a single SM. Please derive the expressions for H , P_m , and P_e in terms of H_k , P_{mk} , and P_{ek} ,

where $k = 1, 2$. (20%)