國 立 臺 北 科 技 大 學

103 學年第二學期電機系博士班資格考試

電 力 系 統 品 質

注意事項：

1. 本試題共 【4】 題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在試卷答案欄內，否則不予計分。
4. 考試時間：二小時。

1. Describe the detrimental effects of power harmonics and voltage variations on distribution system, respectively.　　(25%)

2. Write the equation that define the total harmonic distortion (THD) for voltage waveform. Calculate the voltage THD for the point of common coupling (PCC) with short-circuit impedance 5%，X/R=10, under the load current 1 pu with 5-th and 7-th harmonic components 10% and 5%，respectively.　　(25%)

3. Find the sequence currents (symmetrical components) for a three-phase-four-wire distribution system with line-to-line voltage 480V supplied power to three single-phase loads, 10 kVA, 20 kVA, 30 kVA, which are all same power factor and connected to phase-a, phase-b and phase-c lines, respectively, with common neutral. Furthermore, determine the negative sequence and zero sequence current unbalance factors.　　(25%)

4. Consider a three-phase, 480V line-to-line, 60Hz load bus with short circuit capacity 25 MVA, X/R=10, which normally supply to a constant load 1000 kVA with 0.8 lagging power factor, and a three phase induction motor 500 kW with 0.8 lagging power factor. Determine the bus voltage variation in percentage of normal voltage with respect to the following motor operation condition changes:　　(25%)

(1). The motor is shut down off,　(8%)

(2). The motor is starting with 5 times of normal current and 0.5 lagging power factor, (9%)

(3). The motor power factor is improved to 1. (8%)