國立成功大學

114學年度碩士班招生考試試題

編　號：124

系　所：電機工程學系

科　目：電力工程

日　期：0210

節　次：第 2 節

注　意：1.可使用計算機
2.請於答案卷(卡)作答，於試題上作答，不予計分。

1. A three-phase power transformer can achieve its maximum efficiency of 98% under 70% rated load and rated voltage when the power factor of the connected load is 0.8 lagging. Please determine the efficiency of this power transformer under full-load conditions and rated voltage when the power factor of the connected load is unity. (25%)
2. Three balanced three-phase loads are connected to a three-phase, 480 V, 60 Hz three-phase balanced power supply, two of which are known to be 6 kVA with a power factor of 0.8 lagging for load *A* and 8 kW with a power factor of 0.6 leading for load *B*. It is known that the total power factor of the three combined loads is 0.8 lagging, and the line current flowing from the three-phase balanced power supply is 90 A.
   (1) Please find the active power, the reactive power, the apparent power, the complex power, and the power factor of the unknown load. (10%)
   (2) If the two-wattmeter method measures the total active power of the combined load, determine the readings of the two wattmeters. (15%)
3. A high-voltage power circuit breaker has an interrupting capacity of 3000 MVA, a nominal voltage of 69 kV, and a rated continuous current of 15 kA. It is known that this power circuit breaker has a rated maximum voltage of 72.5 kV, a rated minimum voltage of 60 kV, and a rated short-circuit current of 23 kA under a minimum rated voltage of 60 kV. Find:
   (1) the value of the voltage range factor, (8%)
   (2) the specified short-circuit current at the highest voltage (8%) and
   (3) the rated short-circuit current value when the operating voltage is 69 kV. (9%)
4. A single-phase sinusoidal voltage source is connected to a purely resistive load through a step-down transformer with a turns ratio of 5 and a single-phase full-wave diode bridge rectifier circuit. If the DC voltage across the load is 100 V, find the root-mean-square value of the AC voltage of the secondary winding of the transformer (8%), the root-mean-square value of the AC voltage of the primary winding of the transformer (8%), and the value of the peak inverse voltage of each diode (9%).