1. 簡答題

a. 有一台 220V/10MW 的馬達驅動器，其滿載時之功率因素(Power factor)僅有 0.5，當此驅動器以滿載輸出時，會對電力系統有何影響?[5%]

b. 有一台 110V/480V，10 kVA 的變壓器，當此變壓器之一次側接到 110V 的電壓，而二次側接至一 3 kW 的負載，會發現此變壓器的溫度高於環境溫度約 30^0C。若將二次側的負載完全移除，經過一段時間之後，仍會發現此變壓器的溫度高於環境溫度 10^0C，請說明此現象。[5%] 若將二次側的負載完全移除，而一次側接到 220V 的電壓，經過一段時間之後，卻發現此變壓器的溫度高於環境溫度 40^0C，請說明此現象。[5%]

c. 直流電動機的電樞由轉子及電樞繞線組合而成，應該具有相當成份的電感量，為何一般的直流機等效電路中往往忽略此電感之影響? [5%]

d. 當馬達驅動器將工作頻率提高時，有何優缺點？[5%]

e. 何謂 magnetizing intensity? 何謂 magnetic density? 兩者間有何相關性？[5%]

f. 圖 1 為直流截波電路(DC Chopper)，V_{dc}=40 V，R=10 Ω, L=10 mH，S 的切換頻率為 50 kHz、責任週期(Duty Ratio)為 0.3。若功率元件 S 為高頻的 MOSFET，其額定為 200V, 20A。測試前，所有的元件正常且所有的接線也正確，當此電路實際測試後，卻發現 S 損壞，請說明此現象?[5%]

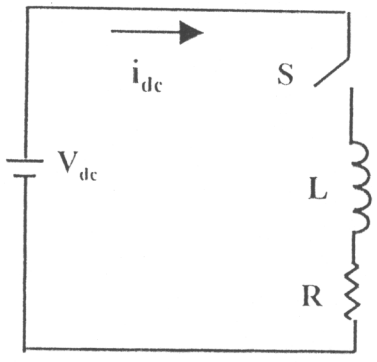

圖 1

2. 圖 2a 為交流電壓接一二極體及 R-L 負載，其中 V_{ac}=150 sinωt V，若輸出電壓波形為圖 2B，請 a) 畫出 V_o 的電壓波形？ b) 算出 V_R 平均輸出電壓？ c) 請說明區間 I, II, III 能量轉換的特性？ [15%]

221630

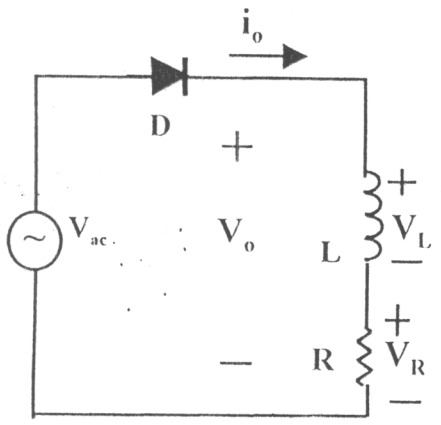

圖 2a

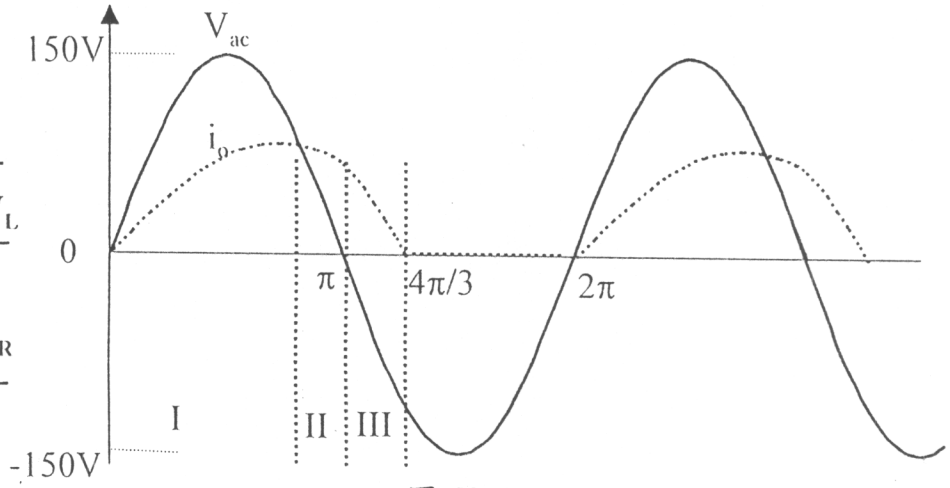

圖 2b

3. A 25,000kVA 13.8kV generator with Xd"=15% is connected through a transformer to a bus which supplies five identical motors, as shown in Fig. 3. The subtransient reactance Xd" of each motor is 10% on a base of 5000kVA, 6.9kV. The three-phase rating of the transformer is 25,000kVA, 13.8/6.9kV, with a leakage reactance of 5%. The bus voltage at the motors is 6.9kV when a three-phase fault occurs at point P. For the fault specified, determine (a) the subtransient current in the fault, (b) the subtransient current in breaker A and (c) the symmetrical short circuit interrupting current (as defined for circuit-breaker applications, the transient reactance of the motor is approach to the subtransient reactance times 1.5) in the fault and in breaker A.(20%)

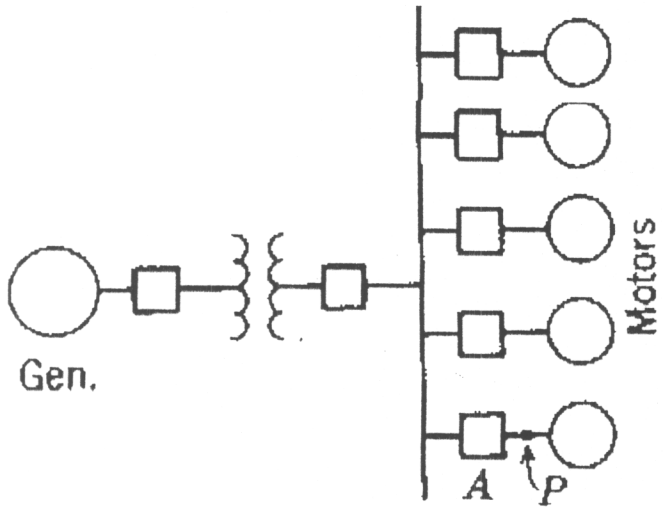

Fig.3

4. What is the LTC (or TCUL) transformer? And why (a) the isolation transformers are used in distribution transformer and (b) autotransformers are often used to connect two transmission lines operating at different voltage levels? (10%)

5. What are the difference between primary and back up protection? Describing there by cascaded protection in low voltage system.(10%)

6. Prove the generalized circuit constants of all transmission-line models satisfy the condition that

AD-BC=1 (15%)